Chapter 4. ENVIRONMENTAL IMPACTS

4.1 Climate, Meteorology, and Air Quality

4.1.1 Air Quality

This project has no components that would adversely affect air quality with the exception of locally-created dust during construction and emissions from construction vehicles and equipment. In particular, VELCO plans to construct the 6.47-mile Irasburg-to-Mosher's Tap line during winter which will minimize the potential for dust emissions.

This section describes the potential for air-quality impacts during the project's construction and operation and below provides calculations of air-quality impacts including the project's conformance with the Clean Air Act (CAA) and State and local requirements.

Any potential air-quality impacts will occur during the construction phase of the project. These would include potential air emissions that could occur during construction from fugitive dust (dust that escapes from a construction site) and equipment exhaust. Mitigation measures to avoid potential nuisance dust conditions and minimize construction-equipment impacts to nearby residents are described next and also in Section 4.3.1.

Fugitive-dust emissions would result from construction along the transmission line right-of-way (ROW) from Mosher's Tap to Irasburg and the associated staging areas and at Highgate, Irasburg, St. Johnsbury, and St. Albans Substations. Construction-equipment traffic, land clearing, drilling, excavation, and earth moving would be the major sources of dust emissions.

Dust emissions would vary substantially from day to day depending on the level of activity, the specific operation, and the prevailing meteorological conditions.

The use of construction equipment would also result in the emission of air pollutants associated with diesel combustion (NOx [oxides of nitrogen], CO [carbon monoxide], SOx [oxides of sulfur], PM10 [particulate matter with an aerodynamic diameter less than or equal to 10 microns] and reactive organic gases [ROG] from the fuel) (DOE, 2004). All construction-vehicle movements would be limited to the ROW or to pre-designated staging areas, the four listed substations, or public roads. Roads and active areas would have requirements either for watering or application of solid chloride pellets appropriate for dust control. Given the limited emissions of the project, it would not be subject to New Source Review (NSR) permitting under the CAA.

Less than about 100 residents in the vicinity of the ROW may be affected by a temporary adverse impact on their local air quality during construction. The average duration for a construction site to be active adjacent to any one residence or business is less than one month; construction of the new line is estimated to be completed in three months, and the Irasburg, St. Johnsbury and St. Albans Substations are estimated to be completed in two months, so any impact on the affected residents near those substations would be within those intervals. Detailed quantitative analysis follows below.

No significant air impacts would occur from ongoing operation and maintenance of the Northern Loop Project. Restoration of the ROW to natural vegetation will mitigate any fugitive dust emissions from the ROW itself. Atmosphere emissions would be produced only by the

occasional maintenance vehicle that would be required to perform infrequent maintenance activities.

Historically, Vermont has had a few instances of federal air-quality standards being violated or State Implementation Plan (SIP) requirements being triggered. Since the early 1980s this has not been the case. Because of persistent regional air-quality-standards violations that continue in most of the northeastern states (only Vermont has no current standards violations), however, Vermont is required by the federal CAA to have a SIP for purposes of addressing regional ozone air quality. VELCO has estimated total emissions for each pollutant of concern.

Also, a conformity review of the proposed project (required under Section 176[c] of the CAA), was conducted in accordance with U.S. Environmental Protection Agency (EPA) and DOE guidance. The review shows that construction project emissions of PM_{10} and CO would be below regulatory thresholds and would not constitute a regionally significant action.

Because the project emissions during operation (post-construction) will be limited to those from occasional maintenance vehicles or equipment, the maximum year of project emissions calculated for the conformity review would be a full year of project construction. To be conservative in terms of estimating the maximum emissions that could possibly occur, a one-year period for project construction was assumed to cover all work with scheduled 6-day work-weeks and with no allowance for work-days lost to bad weather, time off, or holidays. The emissions included within the conformity review are as follows: (1) PM_{10} fugitive dust emission from construction and use of project access, staging areas, and tower and substation areas, (2) PM_{10}

and CO vehicle emissions from construction-access vehicles and heavy construction equipment, (3) possible PM_{10} and CO emissions from explosives blasting for tower and substation construction, and (4) emissions from the personal vehicles of construction workers commuting to and from the project-staging sites.

In accordance with 40 CFR 93.153(b), the total emissions estimates were compared to the applicable threshold emissions rates for the pollutants of concern, as listed in Table 4.1.1-1. For both PM_{10} and CO, the applicable threshold emission rate is 100 tons per year (tpy) (91 metric tons, or tonnes, per year [mtpy]). If the total emissions estimates were found to equal to or exceed the threshold emission rates for any pollutant of concern (shown below in Table 4.1.1-1), then a conformity determination would be required.

Table 4.1.1–1 Regulatory Threshold Emission Rates for PM_{10} and CO.

Criteria Pollutant and Air Quality Classification	**Threshold Emission Rates (tons/year)**
PM_{10} Moderate Non-attainment Area	100
CO Maintenance Area	100

Source: 40 CFR 93.153[b].

The following background assumptions were made for estimating the fugitive-dust emissions and equipment and vehicle emissions. Since precise information is not known, conservative assumptions (potential overestimates) are used (DOE, 2004). The analysis applies cumulatively to all project locations:

- There would be no new unpaved project-access roads for the Mosher's Tap-to-Irasburg Corridor.
- There would be approximately 90 new structures in that corridor.
- Each structure site would require a 100 by 30 ft (30 by 9 m) assembly area.
- All structures would be monopoles.
- There would be only tensioning/pulling sites (each 100 by 100 ft [30 by 30 m]) under active construction or use at any one time.
- Construction would last one full year (for the entire project). There would be two construction crews that would be working a maximum of 6 days a week throughout a year, or 313 days per year. Down time from bad weather, holidays or time off is conservatively assumed to be zero. Twenty-five percent of the segment of the project would be under construction at any one time. It should be noted that these (and the following assumptions are well in excess of the actual levels-of-effort or project task durations expected, so chosen such that the expected actual levels would easily be less than the calculated values.
- Of the 3.3 acres (1.34 ha) of the Highgate Substation, 86 percent (that is, 2.85 acres [1.16 ha]) would be under construction at any one time during the 8-month construction period.
- An additional 5 acres (2 ha) at the staging area adjacent to the line corridor would be engaged in construction activities for 3 months of 6-day work-weeks.
- Each construction crew would utilize the following equipment continuously for 8 hours each day: one planer or bulldozer, one wheeled loader, one excavator, one road truck, one

crane, and one water spray truck (on the conservative assumption that the work could not be done in winter as planned).

- All emissions estimates and assumptions, unless otherwise stated, are based on EPA's "Compilation of Air Pollutant Emission Factors" (AP-42, EPA 1995; also available at http://www.epa.gov/ttn/chief/ap42/)). To calculate the fugitive dust-emissions rate, the AP-42 daily emissions rate of 80 pounds of total suspended particulate matter (TSP) per acre of active construction per day (90 kg/ day) was multiplied by the percentage of PM_{10} in the TSP, which varies with soil type (Wild 1993). The proposed project would cross a range of soil types, from sandy loams (10 to 30 percent PM_{10}) to clay loams (30 to 50 percent PM_{10}). The highest possible percentage of PM_{10} was conservatively assumed to be the 50 percent maximum.
- VELCO would employ dust-control measures on unpaved roads and in work areas. (On the conservative assumption that the work could not be done in winter as planned). A control efficiency of 50 percent was assumed for typical dust control measures, such as watering roads and work areas. This conservative estimate is based on EPA dust-control efficiency assumptions for similar climates, ranging from 54 to 75 percent dust control (EPA, 2002).

In summary, the assumption basis for calculation is that there would be 15.2 acres in construction, 25% at the same time, over 331 days with 50% dust control. The result is a PM_{10} emission rate of 25.24 tpy (22.86 mtpy). The maximum PM_{10} emissions from construction-vehicle and equipment engines are estimated to be approximately 25 tpy. These conservatively-

calculated results are well below the regulatory threshold rates shown above in Table 4.1.1-1. As noted above, this analysis was developed cumulatively to the project's five components:

St. Johnsbury: This substation project's impacts were included in the above analysis.

Irasburg. This substation project's impacts were included in the above analysis.

Mosher's Tap – Irasburg Corridor: As noted above, there may be local air-quality problems along this corridor, especially near sand and gravel operations. Given the typically sandy soils on upland areas throughout this corridor, VELCO will apply some dust-abatement measures when necessary; however, much of the construction is planned for winter under frozen ground conditions, when dust is typically not a concern, and the corridor's impacts were included in the above analysis.

Highgate: This substation project's impacts were included in the above analysis.

St. Albans: This substation project's impacts were included in the above analysis.

4.1.2 Land Features and Use

Geology and Soils

Geology

The construction and maintenance of this project will have generally little or no impact on the geologic features of the region. All of the existing substations previously used careful siting and designs to minimize impacts in the course of their original construction. The use of an existing transmission corridor also will minimize the impact to the area by avoiding the need to disturb virgin ground. There are no areas identified as unique geological areas on the Vermont Land Capability Maps, and it is thus reasonable to conclude that none exist along the existing corridor.

The transmission structures will be designed to withstand loadings caused by the accumulation of ice and heavy winds that exceed the expected earthquake loads in this area. The proposed design meets or exceeds the strength requirements to which VELCO's existing, 500 miles of high-voltage-transmission line in Vermont have been built. These lines have withstood, without damage, several earthquakes over their 50 years of existence (Guidelines for Electrical Transmission Line Structural Loading (1991), American Society of Civil Engineers, New York, New York).

Stone and gravel resources to be used for foundations, access-road upgrading, and building-construction purposes will be acquired locally. Supply pits located near the project's locations

are plentiful and adequate to supply the project without disruption or adverse impact on the pits' ability to supply other construction activities in the area.

According to the Vermont Geological Survey (http.//www.anr.state.vt.us/dec/geo/resourceinx.htm), "the U.S. Dept. of Labor, Mine Safety and Health Administration listed 42 mines in full time operation in Vermont in 2000. Of these, 2 were marble (dimension stone), 25 were slate (dimension stone), 1 was granite (dimension stone), 1 was talc and soapstone, 7 were limestone (crushed rock), and 6 were sand and gravel operations. 142 mines were listed with an intermittent operation status. Of these mines, 89 were sand and gravel operations and the rest included slate, granite, marble, sandstone, stone, traprock and limestone."

Soils

The effects on soil of construction and maintenance of the substation improvements and the proposed re-build of the transmission line, are described below. Most soil disturbance would occur during the construction phase of the project. The degree of impact and its duration will depend on construction activities, soil characteristics and construction season. Increases in erosion are likely to occur when the soil is exposed or disturbed, e.g., during clearing of the right-of-way where necessary. These impacts will prevail until sufficient revegetation has occurred to replace soil-retaining ground cover, i.e., for about six to twelve months (seeding and mulching of disturbed areas will occur within one week of disturbance, producing soil-retaining cover several weeks later). The potential for erosion is greatest when rainfall is heavy or during spring snowmelt conditions. The subsequent runoff from the events can cause sheet, rill or gully erosion.

The amount of erosion that will occur along the ROW will be a direct function of the amount of vegetation that must be cleared. In open cleared areas such as fields, erosion rates will remain relatively unchanged during construction because little further clearing is necessary. Because of the small area involved and VELCO's plan to construct as much as possible when the ground is frozen, erosion due to ROW clearing and substation-site clearing is expected to be negligible.

All substation sites are currently existing and relatively flat, therefore requiring a minimal amount of grading in preparation for the new equipment. All access roads already exist, for both the transmission-line corridor and the substations.

To ensure that erosion will be negligible along the ROW in those sections where additional clearing will have to be done, VELCO will require the contractor to mulch all branches and scrub brush and spread the resulting mulch on the ROW as a ground stabilizer. Additionally, along steep areas, contractors will be required to follow VELCO's standard erosion-control measures (see Appendix D) and seed and mulch on a daily basis.

All of VELCO's erosion-control plans will be filed with the Public Service Board and the Vermont Agency of Natural Resources (ANR). VELCO will have to file an Erosion Prevention and Sediment Control Plan with ANR to show conformance with the Agency's "Erosion and Sediment Control Plan Checklist." Additionally, VELCO will have someone on site to oversee this compliance, and ANR will make field inspections regularly.

The movement of heavy machinery over the soil during construction and maintenance periods may affect local areas of soil. Such movement may result in compaction of surface soils or removal of upper soil horizons. Mechanical compaction of the soils generally reduces soil productivity by reducing rates of water filtration and percolation, restricting root penetration and increasing surface-water runoff or ponding. However, since the Irasburg-to-Mosher's Tap corridor already exists, construction is planned to occur in winter and existing access roads will be used, there is little potential for compaction impacts. If construction activities were to result in compaction that could adversely affect soil productivity, such as use of the land for agriculture or run-off or ponding, VELCO will mitigate these impacts by raking or plowing the area.

Excavation or backfill activities associated with road and pole construction and site work for the substations may also change soil characteristics, bringing rock fragments or boulders to the surface, interrupting infiltration and drainage and increasing erosion. VELCO intends to employ effective mitigation measures to reduce or eliminate potential impacts that could be associated with such disturbances (see Section 4.3.2).

Erosion problems may possibly still persist after the re-build of the transmission line in a few limited areas such as tower sites, access roads and excavations that have not been adequately restored to a good cover by natural-plant succession or artificial seeding. VELCO will pay special attention to restoration of disturbed areas in the ROW so as to minimize this possibility and to correct areas that have not been properly restored.

Agriculture

A problem that occurred during the 1998 ice storm was that farmers were without power to run milking machines and had to buy or borrow individual on-site generators to prevent critical problems with the milking herds.

Productivity of lands for cultivation or hay can be affected by pole placement. This will be mitigated, however, by placing poles at the edges of fields or in hedgerows, especially angle structures or guyed structures, except where it would be absolutely necessary due to the length of span required (and then placed only where poles already exist).

St. Johnsbury: Activity here will be entirely within the substation fence. There is no active agriculture on the lands surrounding the substation, and there will be no impact on agriculture in the vicinity.

Mosher's Tap – Irasburg Corridor: As noted, approximately 3/8^{ths} of a mile (0.375 mile) of corridor passes over active farmlands, and there are today, and will continue to be after the project's construction, 13 poles in fields such that the farmer must work around the poles. The poles therefore impose a certain constraint on farming in these areas. The proposed project will likely require fewer structures (being taller, they can be placed further apart), so VELCO will mitigate the impact on farming by reducing pole placements—potentially several placements—where possible in farm fields.

VELCO will work with individual land owners, including farmers, to determine optimal pole placements in the final design stage. All final design documents have to be filed with the Vermont Public Service Board and the Vermont Department of Public Service for review and approval prior to the start of construction. Despite passing through some active farmland, the six mile swath of replacement poles should not have a significant impact on the primary agricultural soils of the area.

Clearing and maintenance of the existing, 100-foot-wide corridor will not have an effect on agricultural use. In areas of soils with good agricultural potential, pole placement for this project might constrain future agriculture. Farm abandonment is an ongoing process locally, however, and loss of a few square feet of agricultural land to a pole placement would not affect a farmer's decision to continue or abandon farming.

This corridor would not have an effect on maple-syrup production; VELCO will provide additional aid to farmers in maintaining their maple-sap pipelines across the corridor if the pipelines—which connect tree taps to a sap-collection system—are attached to trees at the edge of the corridor.

Highgate: The substation expansion is planned for an area with no current agricultural use. Although the site has soils suitable for farming, if drained, because there is now no active agriculture on the lands surrounding the substation, there will be no impact on agriculture.

St. Albans: As noted, this site, already owned by VELCO, is in a small field (about 2.15 acres in size) that is currently cropped with hay. The addition of a small switching station will remove approximately 9,912 ft^2 of land for this purpose (less than ¼ acre). This site (84 ft. by 118 ft.), for which VELCO has an easement, will be graded.

An alternative to this tap-switching structure that was originally considered was to have a second line from this location to St. Albans Substation, a distance of approximately one mile. However, such a line would have more impacts, with at least 3 more poles in areas of current use. Furthermore, it would not obviate the need for the second structure at the tap location.

Forest Resources

St. Johnsbury: With all of the proposed activity to take place inside the fence, there would be no impacts on forest resources.

Mosher's Tap – Irasburg Corridor: Since much of this corridor is across farmland or abandoned farmland and along alder swamps, only a few areas of forest growth will need to be removed. In these areas, some trees will be removed to widen the corridor to 100 feet. Since the final design has not yet been completed, VELCO does not yet have an exact determination of all of the trees that might need to be removed; however, the clearing will not create a new corridor through forested areas, and this route will therefore have significantly less impact than the alternate corridors considered (see also mitigation measures described in Section 4.3.2).

The recent FERC order with regard to management of right-of-ways will not pertain to this line, as the project voltages do not exceed 115 kV. However, due to the attention that the FERC report brings to the importance of ROW maintenance to reliability, VELCO believes that the clearing of the corridor must be sufficient to ensure that reliability of service in the area will not be jeopardized.

Highgate: The area does not have any significant forest resources that would need to be cleared for this facility's expansion, such that no impacts will occur.

St. Albans: Since the area of this facility is in a field, no impacts will occur.

Earth Extraction

St. Johnsbury: No impacts are anticipated since the planned work will be all within the existing substation fence.

Mosher's Tap – Irasburg Corridor: Replacement of the structures within areas where gravel has been previously extracted will have no adverse consequences for future extraction. This corridor includes one minor relocation (versus the existing corridor), north of Irasburg Substation, to accommodate the landowner's plans to extract gravel in a particular location. It is possible that other pole relocations will be required in future to accommodate further extraction. VELCO will relocate the poles when necessary to allow extraction.

Highgate: Since there are no significant earth resources in the vicinity of Highgate Substation, there will be no adverse impact on earth resources.

St. Albans: Although existing in the area, earth resources would not be extracted from this already-disturbed location; also, the project will not affect resources adjacent to but not within the substation's site. There will thus be no adverse impact on the area's earth resources.

Recreation

St. Johnsbury: Since all of the proposed activity will take place inside the fence of the existing substation, there will be no impacts to any recreational activity.

Mosher's Tap – Irasburg Corridor: This project is sufficiently remote from the centers of recreation at Lake Memphremagog that there will be no adverse impact to any recreational opportunities. Since the project is contemplated as a pole-for-pole replacement of the existing line, no conflicts with any snowmobile trails that cross the corridor today will result. Some all-terrain vehicle (ATV) use already occurs in this corridor, and VELCO states that it does not expect that ATV use will increase as a result of the existing line's replacement.

Highgate: Existing ATV use of the project lands, which may constitute trespass on land owned by VELCO or Citizens, would probably be diminished outside the fences of the connected and expanded substation as the expansion will encompass a portion of the land (and trails) the ATV

riders now use. Additionally, if VELCO determines that it could help limit the access to the surrounding area, an access gate will be constructed at the entry to the access road off Route 78.

Most of the area outside the substation will not belong to VELCO, however, so VELCO will have no jurisdiction over ATV use.

St. Albans: No impacts would be likely to accrue as no nearby recreational uses were observed or are known.

Residential, Commercial and Industrial

St. Johnsbury: No changes in land use of surrounding lands will be required for work inside the substation.

Mosher's Tap – Irasburg Corridor: No direct impacts on residences will be required for the project within this corridor. Any indirect impacts will relate primarily to aesthetics (see Section 4.3.6) or to perceived effects of electromagnetic fields (see Section 4.3.8).

As noted in Section 4.1.2, VELCO has slightly altered the corridor in one location to accommodate sand- and gravel-extraction on one landowner's property, thereby ensuring that no impacts to these extraction activities will thus occur.

Impacts to the "bed and breakfast" and restaurant on Heermanville Road in Coventry will relate primarily to aesthetics; no physical impacts will accrue (see Section 4.3.6). VELCO believes that perceived visual impacts from the presence of the line will not be significant because the line runs along the edge of the tree line at the very back of the property, and at present there are only three poles. In the final design stage, it may be possible by the use of longer spans to actually eliminate one of these poles; and VELCO would effectuate this by use a longer span if it can do so consistent with its design requirements.

Photographs 7, 8, and 9 in Appendix C show how the existing corridor is located along the beginning slope of the ridgeline, and illustrates how the forested hillside provides background that mitigates the view of the line. As seen in Photo 8, it appears that the existing distribution lines alongside the road actually have a more visible impact on the "bed and breakfast" and restaurant than would the transmission line in the background.

This is also true for the church near the tap location at the intersection of Alder Brook Road and State Route 105: the distribution line will have more visual impact than the proposed line as viewed from the church because the forested hillside will serve as a backdrop. Appendix C, Photos 19, 20, and 21, shows the area around the church. The aerial photo, Photo 19, shows that the line and tap location touches just a corner of the church property, away from the church itself.

Highgate: No impacts on residences or businesses would be anticipated, other than temporary traffic and dust impacts for the neighboring residence during construction. The area surrounding

the substation is remote, with only one residence in somewhat close proximity (approximately 300 - 400 feet away). VELCO will apply the dust-control measures discussed in Section 4.3.1.

St. Albans: No impacts are anticipated on any residences or businesses, as none are nearby.

Airports, Navigation, Training Areas, Public Facilities and other land uses

St. Johnsbury: No changes in land use of surrounding lands will be required for work inside the substation.

Mosher's Tap – Irasburg Corridor: This corridor will not present conflicts with any such land uses. It is sufficiently remote from the Newport State Airport in Coventry that no air-safety measures are necessary, as mentioned previously in Section 3.2.7.

Highgate: No conflicts with public facilities have been identified, and no impacts are anticipated.

St. Albans: There being no such facilities in the project vicinity, no impacts are anticipated.

4.1.3 Hydrology, Water Quality and Water Use

4.1.3(a) Surface Waters

St. Johnsbury: No additional impervious surfaces will be created and no runoff created, so there will be no changes to any surface waters.

Mosher's Tap - Irasburg Corridor: No impacts are likely to the major rivers and waterbodies in the region. The corridor passes over Ware Brook, Stony Brook, and several intermittent and permanent streams. Ware Brook is in a pasture where the corridor crosses it, is open to the sun, and experiences some stream bank erosion (from cattle trampling). The widening of the corridor to the ROW's full 100 feet may remove some high shade from the other streams; however, shrubs (especially alders) along the streams will be retained, and there will be no significant adverse impacts to surface waters.

VELCO will follow its normal vegetation-management protocol, which does not allow spraying of herbicides within 30 feet of standing water. Normally, the growth of shrubs and thick vegetation along streambanks is promoted by the clearing of trees, and stream banks are stabilized by this growth (unless, as noted, they may be trampled by livestock. Crossing these streams with equipment is not contemplated, and erosion-control measures undertaken during construction, such as are described in Section 4.1.2, will ensure that no adverse impacts will accrue to surface waters. Accordingly, no impacts to the major rivers and waterbodies in the region will occur.

Highgate: A culvert beneath the proposed expansion will direct runoff from the northern portion of the property to the small stormwater pond. Because there will be no impervious surface created (the crushed stone of the substation being semi-pervious or pervious), runoff to this pond area, and subsequently off-site, will not be altered. There will thus not be any undue adverse effects from the expansion.

St. Albans: There being no surface waters in proximity to the St. Albans Tap site, no impacts will occur.

4.1.3(b) Flood Waters

St. Johnsbury: The project is not subject to floodwaters, and no impacts will occur.

Mosher's Tap - Irasburg Corridor: Although several structures along the valley floor of Stony Brook would be within the 100-year floodplain, single-pole power-line structures will not exacerbate flooding as poles will not impede floodwater movement or reduce floodwater-storage capacity.

Highgate: The project area is not within the floodplain or a floodway, so no impacts will occur.

St. Albans: The project area is not within the floodplain or a floodway, so no impacts will occur.

4.1.3(c) Ground Water and Water Supply

St. Johnsbury: Because this site is outside the local water-supply protection area, no impacts to public water supply will occur. Also, since there will be no additional creation of impervious surface, there will be no adverse water-supply impacts.

Mosher's Tap – Irasburg Corridor: The power line would not affect aquifer recharge, and, as no public-water supplies are located within the corridor, no adverse impacts will occur. Potential impacts to private wells are addressed in VELCO's annual, herbicide-treatment permits, which do not allow herbicide application in proximity to private wells. See Appendix D (VELCO's four-year vegetation management plan) & F (1998 herbicide permit).

Highgate: There being no public or private water supplies near this site, no impacts will occur.

St. Albans: No material impacts to groundwater recharge would accrue from this limited installation. There being no public- or private-water supplies near this site, no impacts will occur.

4.1.3(d) Wetlands

St. Johnsbury: Since all of this project element is contained within the substation fence, there will be no impacts to any wetlands in the vicinity.

Mosher's Tap – Irasburg Corridor: The project corridor passes over several wetlands. Since the project is contemplated as a pole-for-pole replacement of the existing power line, and since the wetlands are for the most part spanned between poles, impacts will have "minor individual and cumulative impacts" as determined by the Army Corps of Engineers General Permit #58 (see Appendix B). The types of wetlands involved–most of them being either alder swamps or "wet meadows" on abandoned farmlands–are not as likely to be seriously affected as would forested wetlands, in which VELCO would have to remove mature trees. A wetland Conditional Use

Determination for the project has been obtained from the Vermont Agency of Natural Resources (see Appendix B), which concludes that the project will not cause adverse impacts to any protected functions and values of the wetlands along this corridor.

Highgate: There will be an impact to approximately 33,881. ft.^{2} of wetland at this site (less than 4/5^{ths} of an acre); it will be filled for expansion of the substation. However, the wetland has demonstrably low scores for functions and values, such that the consequences of this loss of wetland area would not be significant. Because these wetlands were determined to be classified as "Class 3," only the Army Corps of Engineers General Permit was required (Appendix B). As noted in this Permit, the Vermont Agency of Natural Resources does not require a permit for work done in or around Class 3 wetlands. However, the Agency did provide comments to the Army Corps of Engineers in connection with VELCO's application for a General Permit, but the Agency raised no consequential wetland issues.

St. Albans: There are no wetlands in the project vicinity, which is located in an upland field.

4.1.3(e) Water Quality

The Northern Loop Project will not adversely affect water quality since erosion-control plans for the various project elements are being developed that will serve to effectively prevent adverse construction impacts on water quality. There will be no post-construction operational impacts since the vegetation in the corridor will trap sediment, utilize nutrients, and capture any pollutants that may be present.

St. Johnsbury: The installation of additional equipment here, within an existing stabilized-substation area, will not cause any water-quality problems, as VELCO will use appropriate erosion controls. See Appendix D which outlines VELCO's erosion-control plan.

Mosher's Tap – Irasburg Corridor: The proposed project will not have any significant water-quality impacts for the reasons previously given in Section 4.1.2., i.e., implementation of erosion controls during construction and a vegetated corridor post-construction. See Appendix D, an outline of VELCO's erosion-control plan as noted above.

Highgate: The expansion of the substation here will not cause degradation of water quality because it does not require the creation of a significant area of impervious surface; hence stormwater runoff will not be unduly increased, and it will not result in the generation of any pollutants. The presence of a small existing stormwater pond on the site will serve to slow runoff and maintain water quality. Erosion control will be implemented during construction. See Appendix D.

St. Albans: No impacts are anticipated; erosion-control measures will be implemented during construction. See Appendix D.

4.1.4 Ecology

4.1.4(a) Flora - Terrestrial/Uplands

St. Johnsbury: Since all of the project elements at this site are to be within the fence, there would be no impacts to surrounding vegetation.

Mosher's Tap – Irasburg Corridor: There will be incremental clearing of vegetation, including trees, along the edges of the existing cleared corridor in the areas where it is forested. In these areas, grasses, herbs, shrubs, and sapling trees will grow to replace the cleared vegetation and will be managed over time in the same manner as the existing corridor's cleared areas. Given the nature of the area, most of the species expected to be present will be native species. The forest that will be cleared is of a type abundant in the area; accordingly, there would not be any loss of unusual flora. Although there are sugar operations in the vicinity and a plastic pipeline that taps maple trees was noted to cross the corridor, no maple-sugar tree that is tapped will be removed. The habitat is not significant for maple-sugar production, however, especially in comparison to the alternative corridors considered, and is not considered to serve other significant habitat functions. Non-forested areas, such as old fields and scrub/shrub wetlands, will not be altered by clearing.

Highgate: The consolidation and expansion of the two substations will remove some vegetation from the site, none of which is rare or endangered. For a description of this site's vegetation, see Sections 3.4.1 and 3.4.3 above. The plant communities on the undisturbed part of the site will remain in a state similar to their current condition.

St. Albans: Since this area is and will continue to be managed as a hayfield, no changes to vegetation will result after restoration of the hayfield soils following construction.

4.1.4(b) Flora - Aquatic/Wetlands and Waterbodies

St. Johnsbury: No impacts to aquatic or wetland vegetation in the vicinity are expected as construction will be limited to the already-disturbed area within the substation fence.

Mosher's Tap – Irasburg Corridor: Because many of the wetlands along this project corridor are dominated by speckled alder, which typically grows less than 15 – 20 feet tall, these will be retained with trimming. Understory species composition and "wet meadow" wetlands will not be altered as the line will be placed to pass over these wet areas. There is no change anticipated to any purely aquatic habitats, therefore, as again the line will be placed to span the few streams and brooks crossed.

Highgate: The wetland community, outside the one area of direct impact previously described (in Section 4.1.3), is not anticipated to be altered.

St. Albans: There are no wetland communities in the project vicinity.

4.1.4(c) Wildlife

4.1.4(c) i. Wildlife-Terrestrial/Uplands

St. Johnsbury: Because all of the proposed activity will occur within the substation fence, no habitat will be lost and no impacts are anticipated.

Mosher's Tap – Irasburg Corridor: There will be incremental clearing of the corridor, which may affect a few "edge specialists." However, VELCO does not anticipate that there will be any habitat changes that would cause loss of habitat value or wildlife populations or disruption of wildlife movement patterns. The single exception is a single small segment of deer-wintering habitat along the edge of the existing corridor that will be slightly affected. This segment that will be cleared is at the edge of a very large 1332-acre (about 2.1 square miles) mapped area and accounts for only 0.03% (three-tenths of one percent) of the available habitat; the remaining habitat will continue to provide shelter for overwintering deer as at present.

Highgate: There may be some displacement of songbirds; however, there will not be significant disruption of populations. There will be no change to the habitat on adjacent lands, so their use by snipe will be unaffected.

St. Albans: No impacts are anticipated as there is minimal evidence of wildlife use of the site and adjacent land.

4.1.4(c) ii. Wildlife - Aquatic/Wetlands and Waterbodies

St. Johnsbury: There is no aquatic or wetland habitat in the vicinity of St. Johnsbury Substation.

Mosher's Tap – Irasburg Corridor: Impacts are anticipated to be few if any since the power line will mostly span the wetlands and streams. Because the project is separated from South Bay of Lake Memphremagog by a high ridge, no adverse impacts to that resource will occur.

The alder swamps along Stony Brook will be minimally affected principally during construction, but, because that cover type can grow to maturity under power lines without affecting the lines, the existing habitat values will be preserved. Routine corridor maintenance will result in competing, taller, woody vegetation being cut, and successional stages favorable to alder will be preserved by not removing (but only trimming) alder.

Fisheries, found primarily in Stony Brook, will be protected because VELCO will preserve most overhanging shrubby and herbaceous riparian vegetation to maintain cover and erosion control. No construction-equipment crossings of streams are planned, and ROW clearing will be minimized near streams.

Highgate: A small area (approximately 31,881 sq. ft.) of scrub-shrub wet meadow will be lost to the project; however, this is a habitat type common in the area. More valuable, open-water habitats and stream courses nearby will be unaffected.

St. Albans: There is no aquatic or wetland habitat in the vicinity of the St. Albans project site.

4.1.4(d) Rare and Endangered Species

VELCO's consultants surveyed the existing ROW. With the exception of one State-listed species, considered below, the consultants found no federal- or State-listed threatened or endangered species, no rare species tracked by the Vermont Non-Game and Natural Heritage Program, and no other adverse impacts on vegetation or wildlife.

4.1.4(e) Threatened and Endangered Plants

St. Johnsbury: There are no such species in the project area.

Mosher's Tap – Irasburg Corridor: As noted, the State-listed Greene's rush (*Juncus greenei*) occurs in the vicinity of Irasburg Substation. Plants inventoried in 2001 and in July 2003 occurred outside the proposed building envelope and will be avoided during construction. Because plant populations are dynamic, however, there is always a possibility that new individuals, not previously mapped, will be discovered. If so, these will be mapped, and VELCO will avoid them. If these plants cannot be avoided, a permit to take any affected plants must and will be sought from the Vermont Agency of Natural Resources. The majority of the Greene's rush occurs outside the area of the proposed construction so that the population will remain viable. No other species of concern in the project vicinity are known, and no direct or indirect impacts will occur.

Highgate: There are no federally-endangered or State-listed species of plants known in the project vicinity, so no impacts will occur.

St. Albans: There are no federally-endangered or State-listed species of plants known in the project vicinity, so no impacts will occur.

4.1.4(f) Threatened and Endangered Wildlife

No federally-listed species of threatened or endangered wildlife is known to inhabit or use habitats (other than as transient individuals) within or near the project areas, so no impacts will result. Among listed State species, upland sandpiper may occur along the Mosher's Tap-to-Irasburg Corridor, although its presence specifically along this corridor has not been documented. In any case, management of a power-line corridor would be compatible with upland sandpiper which would be retained in the ROW.

4.1.4(g) Natural Areas

There are no identified natural areas at any of the project sites. Some have been identified within one mile of various project components; however, no impacts will occur since there will be no construction outside the specific areas proposed.

4.1.5 Socioeconomic Consequences

4.1.5(a) Population

Because the proposed corridor runs through low-growth agricultural areas and is in an existing corridor, and because the project is planned principally for the purpose of improving reliability for existing electrical loads, little change in future population distribution in Caledonia, Orleans or Franklin counties will result from the project.

4.1.5(b) Institutional Setting

VELCO expects the work crew to be at any one location no more than six months (the construction at the Highgate Substation), and for many locations the duration will only be a couple of months. Most of the individuals who will work on the construction of the re-built line and upgrades to the substations will commute from other areas. Long-range commuting is normal in Vermont, the country's most rural state. Consequently, the project will not affect the provision of local services, such as schools.

4.1.5(c) Employment and Economics

There could be a slight short-term increase in employment and some economic benefit in the towns affected by this project (St. Johnsbury, Irasburg, Coventry, Newport, Highgate and St. Albans) as people will be employed to help build the project. Some of the workers will be VELCO personnel, but others will be hired by contractors. VELCO expects the construction stage to take approximately one year.

Because the project requires special skills and experience, contractors and workers from outside the area will probably make up most of the construction workforce. A survey of transmission-line construction workers shows that local workers are more likely to be hired for clearing ROW than for other project tasks. Because of the large portion of the corridor already trimmed due to the existing line, few people will be hired for this purpose. Thus, constructing the new transmission line and upgrades to the substations will have only a slight, albeit positive effect on local employment.

Because non-local workers will be brought in to construct the project, some short-term increases will occur in local taxes and in sales by local commercial operations (e.g., restaurants, food markets, and entertainment and lodging facilities). The small number of workers, coupled with the short project duration and the ability to commute, will not affect the tourist industry in the area. VELCO estimates that it will take about 10 workers around two or three months to construct the new line, about 8 workers for a duration of six months to construct the improvements at Highgate, and 5 workers to do the work at Irasburg and St. Johnsbury for a period of six months. Assuming that all workers are from outside the region, and using a per diem of $120 (hotel and three meals), there could be an increase in sales of several hundred-thousand dollars.

Additionally, all the affected towns will see an increase in their revenues through taxes on the line and substations. In Vermont, utility facilities are subject to local assessment. VELCO submits the suggested value of its facilities in each town, usually based on construction costs, to the Vermont Public Service Board (PSB). The PSB, in turn, provides each town with the value

submitted by VELCO. Each town then assesses these properties at fair market value, applying its and the State's educational tax rates to assess and then collect local and State taxes.

In the past, VELCO has taken an immediate one-time deduction for depreciation; no further depreciation occurs over the life of the facilities. As a result of this process, the towns and State would receive added tax revenues consistent with their tax structure throughout the life of the facilities.

For additions to each individual town's grand list, see Table 4-1 below.

Table 4-1:

Total Estimated Increase in Value of Improvements per Town

St. Johnsbury	$1,200,000
Irasburg	$2,000,000
Highgate	$5,500,000
St. Albans	$1,500,000
Irasburg – Mosher's Tap Line (Would be allocated between Towns of Irasburg, Coventry and Newport City)	$5,700,000

Landowners whose property is crossed by the line will be compensated for the fair market value of the easements. There are 39 landowners along the proposed 6.47 miles of corridor. Since the corridor already has an existing line that has been in place since the 1920s and before the homes were built, these landowners should not experience a drop in property values. Landowners abutting the substations should experience no impact to their property values.

4.1.5(d) Environmental Justice

VELCO and DOE have evaluated whether the project raises issues of environmental justice. VELCO has advised that the project does not raise environmental justice concerns, as discussed below.

Every substation and transmission line that will be affected by this project exists today. Anyone impacted by the project is already affected by the location of these substations or the existing line. VELCO states that it selected the preferred corridor for the line and decided to make related necessary improvements to substations serving what will become a looped transmission line because locating the project at existing sites minimized adverse impacts; VELCO states that it did not choose these locations to avoid non-minority or middle- and high-income populations that might oppose the project or increase easement-acquisition costs.

As stated previously, the areas served by the proposed project, especially the areas located in the Northeast Kingdom, lag the remainder of the state economically. One of the primary purposes of the project is to provide these areas the same level of electric reliability that most of the rest of the state enjoys. With reliable electric service, VELCO believes these areas will have a chance to compete for new industries and businesses and be better positioned to retain existing ones.

4.1.5(e) Housing

The proposed corridor will have little or no effect on housing since this project will not directly contribute to an increase in population. There are 13 houses along the corridor within 500 yards. The power line will be visible from these homes. For the most part, the line is located behind the homes.

The substations are for the most part well hidden, Highgate being the exception. All substations exist today, however, and therefore there should not be any incremental impact on housing values.

It is important to note that the project's ROW corridor is in an area that is already impacted as the transmission-line corridor has been in place since the 1920s. Also, along the roadsides are distribution lines, already affecting the landscape and views.

The effect on the resale value of houses and property in proximity to, or in sight of transmission lines, has been studied in urban, suburban and rural settings. Some studies have identified no long-term effect, finding that the real-estate market is deep enough so that some buyers will pay a price for the land or housing in close proximity to a line that is comparable to prices for similar properties at a distance from a line. After a line is built, buyers will pay a price that is similar to the value prior to the existence of the line (Vredenburgh 1974, 1982). Other studies have shown a 16% to 29% drop in price of properties along a line, with the smallest properties experiencing the greatest drop in selling price. Decreases in selling prices taper off with larger lot sizes and

increased distance from the line, regardless of the size of the line (Kellough 1980). A more recent study in Toronto, evaluating more than 27,000 residences and using actual transaction prices, not appraisals, found conclusive evidence of a loss in value between 4% and 6.2% (Haider, Murtaza; Haroun, Antoine; Miller, Eric J.; 2004).

Effects generally appear under two short-term conditions: (1) sales of properties—subdivided before the line was proposed—during planning or construction, or soon after the line is built; and (2) sales or construction in progress that is slowed or cancelled when the line is proposed. Although neither of these conditions may reduce long-term sales values, they might have an adverse effect for a short time. There should be minimal short-term or long-term effects on resale values because power lines and substations already exist throughout the area in essentially the same locations.

4.1.5(f) Transportation

Direct transportation impacts will be limited primarily to the construction period and will be minor. Some slight interference with local and tourist traffic on the routes used by construction-related vehicles might occur, along with a slight increase in noise and dust. The indirect impacts of views from the roads will be greater than direct impacts. The line will be more visible to travelers on some of the roads running through Irasburg and Coventry. See Section 4.1.6 for a discussion of visual impacts.

4.1.5(g) Public Concerns

Starting in 2001 and continuing through 2003, VELCO met on numerous occasions with the planning commissions and selectboards of all of the potentially-affected towns. By letters dated May 28, 2002, and June 13, 2002, provided in Appendix D, VELCO contacted the Coventry Planning Commission, the Northwest Vermont Regional Planning Commission, the Town of St. Johnsbury, the City of Newport, and the St. Albans Town Planning Commission to provide them with the Northern Loop Project plans. Representatives of VELCO then met with the Northeastern Vermont Development Association on May 23, 2002, the Town of Highgate on June 3, 2002, the Town of Irasburg on June 10, 2002, the Town of Coventry on July 8, 2002, the Town of St. Johnsbury on July 17, 2002, and the Town of St. Albans on October 8, 2002 (see Table 3.3 above for a list of town officials to whom notices for this project were sent).

On February 20, 2003, public site visits and a public hearing was held by the State of Vermont Public Service Board. No public attended the site visits, but several persons (including two land owners) attended the public hearing (see transcript in Appendix B). Their main concerns were the aesthetic impact of the new double-circuit line and potential electromagnetic field (EMF) health implications of the new lines.

4.1.6 Visual Resources

4.1.6 (a) Visual Impact Analysis Criteria

While a power line is an intrusion on any scenic rural area, the corridor from Irasburg to Mosher's Tap already has an overhead line (48 kV) as well as numerous distribution lines scattered throughout that are visible from almost any vantage point in or near the proposed new line. In planning and constructing this re-built line, actions will be taken by VELCO to provide mitigating measures that would minimize the impact. See Section 4.3.6.

Although not a sufficient test to satisfy NEPA requirements, the following evaluation is useful and informative as a measure of potential visual impact. The criterion used in the State of Vermont to analyze "adverse, undue" impacts is the "Quechee Test." The Quechee Lakes methodology involves a two-step inquiry. First, will the impact of the proposed project be adverse? The test for adversity turns on "fit," i.e., does the proposed project fit within the context of the area in terms of form, height, color and use? A project would have an adverse impact on the aesthetics of an area if its design is out of context or aesthetically inharmonious with the area in which it is located.

If it is found that the impact would be adverse, the second step is to determine whether such an impact would be "undue." Such a finding would be required if: (1) a proposed project violates a clear written community standard intended to preserve the aesthetics or scenic beauty of the area; (2) it would offend the sensibilities of the average person; or (3) generally available mitigating steps will not be taken to improve the harmony of the proposed project with its surroundings. This project is in conformance with this test.

First (and assuming that project facilities, all proposed to replace or improve existing transmission-line or substation facilities, are out of context and thus "adverse"), there is no clear written community standard that identifies this corridor or this landscape as unique or scenic, and, to the extent there are standards for transmission facilities in relation to scenic resources, the project conforms by using existing ROWs as noted in Section 2.2.

Second, this project should not be "shocking or offensive" to the casual observer: It is a normal expansion of an existing and accepted land use and service to support increased electrical demand and improve reliability, and the proposed facilities are not in contrast with, and do not compromise the quality of, unique, rare, or even high-quality scenic landscapes.

Third, the project will use mitigation measures to minimize any adverse visual effects, measures described below in Section 4.3.6.

Overall, the line's visual impact will not be significant as the reconstructed transmission line will have the same location and the impact of its increased height will be offset by the mitigation measures described below in Section 4.3.6. In addition, VELCO will consult adjacent landowners about the specific location of each pole, which typically can be moved by up to 20 feet from the placements for the existing poles to reduce adverse visual impacts.

4.1.6(b) Visual Impacts along the Proposed Route

The description of the existing corridor that will be used for the project is provided in Section 2.1.1. Co-locating the transmission circuits on the same pole structures, along with maintaining the existing 100-foot-ROW width, will require the new poles to be approximately 20 feet higher than the existing structures in most locations (from approximately 44 feet above ground to 66 feet above ground). See photo simulations in Appendix C. Since most mature woodland is in the 60-70 feet range, substantial screening is provided in most of the wooded areas (3.5 miles out of the 6.47-mile corridor).

There now exist two sections of this line that are under-built with distribution. In those two sections of the line where the existing Citizens 12.5-kV distribution line is co-located on the existing 48-kV structures, the new poles will need to be approximately 30 feet higher (to about 70 feet). The first segment is approximately 1.1 miles long, from Citizens' Irasburg Substation to the Linton Parcel, and the other section is approximately 1.3 miles long, along Alderbrook Road in Coventry from the Knight Parcel to the W. & G. Lawson parcel.

The first segment with distribution under-build is not visible for the first one-half mile from the Citizens substation. It is visible, however, when it crosses the open landscape from Back Coventry Road to Heermanville Road, a distance of 1000 feet. Because of the single pole and insulator symmetry, the change to the existing situation will not be conspicuously evident. The second 1.3-mile segment occurs along Alderbrook Road near Mosher's Tap; mitigation of visual impacts for this segment is described in Section 4.3.6.

The existing transmission corridor, which has been in this location for many years, extends approximately 6.47 miles. With the exception of a few locations, the existing line is located in wooded areas or is otherwise remote from view, and the line upgrade will occupy the same corridor. Accordingly, the upgrade should be hardly noticeable in these wooded areas.

The areas of most visual significance (with respect to both the existing line and the proposed new line) are limited to two areas: (1) where the corridor currently extends approximately 1000 feet from Back Coventry Road to Heermanville Road (at approximately mile 1.1 – 1.3) and (2) in the Alderbrook Road neighborhood, including Mosher's Tap. Mosher's Tap currently consists of two structures with rigid insulators for two 120-kV circuits. The southern circuit is Citizens' former 48–kV line, where the line from Irasburg connects. The proposed project is to carry the 115-kV circuit under the existing two circuits to an H-frame north of the 120-kV line and then back south to tie into the existing 120-kV line formerly owned by Citizens. VELCO also proposes to add a new double-switch structure on steel poles east of Alderbrook Road. It appears that the area under the existing tap is wetland, and, since it is close to the road, it will be difficult to screen. See photos in Appendix C. Mitigation is discussed in Section 4.3.6.

4.1.6 (c) Visual Impacts at Substations

4.1.6 (c) i. St. Johnsbury Substation

All of the improvements will be within the existing fence, and none of the substation is visible from the closest roads. Therefore, there will be no adverse aesthetic impact.

4.1.6 (c) ii. Irasburg Substation

The Irasburg Substation is set back several hundred feet behind a densely-vegetated hill and is not visible from the roadway. The new improvements will also not be visible from the roadway. There will be no adverse aesthetic impact.

4.1.6 (c) iii. Highgate Substation

By combining the two existing substations and utilizing only one of the two access driveways, the entire complex will be better screened with conifers, cedar and hemlock planted by VELCO. The proposed planting includes a cedar hedge (4 – 5 ft.) along the south and partial east side of the substation fence (exposed Route 78 frontage). The hedge will be planted a minimum of 10 feet from the fence line, to meet the safety-clearance standards. The east side of the substation is already partially screened. At the former access drive, VELCO will plant three 2"-caliper, native apple trees and 35 gray dogwoods (3 to 4 ft. tall), which are native shrubs suitable for the conditions of the substation site, to screen the yard service and equipment from view. Roadside plantings and a loose cedar hedge (4 – 5 feet will screen substation equipment located 58 feet back from the fence line.[15])

The combination of the two substations into one organized facility served by only one roadway will also improve the visual impact (Boyle, 2002).

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15 A note on the type of trees that can be planted for mitigation: Since there are numerous overhead transmission lines going in and out of the substation, the type of plantings that can be used are limited to slow-growing trees and shrubs (see discussion in the ROW Maintenance Plan, Appendix D).

4.1.6(c) iv. St. Albans Substation

Although there will be improvements (see Section 2.1.2 for a complete description of improvements), such as grading and the addition of a control hut, the site is not visible to the public due to its remote location. Additionally, the existing switch will be removed, and the disconnect switches replacing it will be 30 feet lower in height (a reduction from 85 feet to 55 feet).

4.1.7 Cultural Resources

In November of 2001, VELCO retained the services of the University of Maine at Farmington's (UMF) Archaeological Research Center to perform a preliminary site-sensitivity study along the existing 48-kV line from Irasburg to Mosher's Tap and at the Highgate Substation area. See Appendix F.

In the summer of 2002, as the project became more defined, Douglas Frink of Archaeology Consulting Team was retained to assess the entire project's archaeological impacts. Mr. Frink performed an Archaeological Resource Assessment Study (ARA) for the Irasburg, Coventry and Newport area as well as for the St. Albans area. Due to the high sensitivity of the Highgate region, Mr. Frink also conducted a Phase I Archaeological Site Identification Study for the Highgate Substation area.

VELCO filed Mr. Frink's ARA (see Appendix F) for the proposed Irasburg-to-Mosher's Tap, 115-kV line with Mr. Scott Dillon of the Division of Historic Preservation on September 17, 2002.

On March 31, 2003, VELCO received a letter from Emily Wadhams, State Historic Preservation Officer, making six recommendations to be included as conditions to the Certificate of Public Good issued by the Vermont Public Service Board. In a stipulation between VELCO, Citizens, the Vermont Department of Public Service, and the Vermont Agency of Natural Resources, which was accepted by the PSB in connection with its issuance of a Certificate of Public Good for the project, VELCO affirmed that it would comply with all the recommendations (Appendix B). See list supplied below.

The Division concurred with the consultants' conclusion that no historic properties will be affected by the improvements proposed at St. Albans Tap or Highgate Substation (see letter in Appendix B).

The consultants did identify twenty potential precontact (prehistoric) and two historic, archaeologically-sensitive areas along the proposed Irasburg-Mosher's Tap upgrade; the twenty-two archaeologically-sensitive areas are depicted in the survey in Appendix C. The Division requires additional archaeological evaluation if the identified areas cannot be avoided or protected from impacts during project construction, and VELCO accordingly decided to avoid all identified areas so that no such review will be required.

The Division, again, recommended six conditions which were incorporated into the stipulation (see Appendix B) included in the Vermont Public Service Board's Certificate of Public Good for the Northern Loop Project. The six conditions are:

1. VELCO will map the twenty-two archaeologically sensitive areas on the site plan and label them as not-to-be-disturbed buffer zones. Copies of this revised site plan will be submitted to the Public Service Board and to the Division.

2. Topsoil removal, grading, scraping, cutting, filling, stockpiling, logging or any other type of ground disturbance is prohibited within the buffer zones without written approval of the Public Service Board and the Division. The project contractor will be fully notified about the buffer-zone restrictions.

3. In the event that maintenance of one or more of the buffer zones is not possible due to project constraints, an archaeological study to identify sites in the buffer zone will be carried out by a qualified archeologist prior to construction. The study will be scheduled accordingly so that mitigation measures that may be necessary can be satisfactorily planned and accomplished prior to construction.

4. All archaeological studies and assessments must be conducted by a qualified consulting archeologist and must follow the Division's "Guidelines for Conducting Archaeological Studies" in Vermont. VELCO's archaeological consultant should submit any scope of work to the Division for review and approval.

5. No archaeological sites will be impacted until any necessary mitigation measures have been carried out. Mitigation may include but is not limited to further site evaluation, data recovery, redesign or one more proposed project components, or specific conditions that may be imposed during construction.

6. Proposed mitigation measures will be discussed with and approved by the Division prior to implementation, and a copy of all mitigation proposals will be filed with the Public Service Board. The archaeological studies will result in one or more final reports, as appropriate, that meet the Division's Guidelines for Conducting Archaeological Studies in Vermont. Copies will be submitted both to the Division and to the Department of Public Service.

The areas under consideration for the Northern Loop Project will not affect "traditional Cultural Properties." Although the Abenaki (aka Western Abenaki) are not recognized by the State of

Vermont, Mr. Douglas Frink of Archaeology Consulting Team presented the project to Chief April Rushlow of the Abenaki, and she did not identify any cultural resources that would be affected or raise other concerns.

The Project will not have an undue adverse impact on historic sites. No known archaeological sites exist within the project boundaries.

As noted, the University of Maine at Farmington's (UMF) Archaeological Research Center performed a preliminary site-sensitivity study along the existing 48-kV line from Irasburg to Mosher's Tap and at the Highgate Substation area. The report concluded that 22 archaeologically-sensitive areas exist in the Irasburg-to-Mosher's Tap corridor and that, if the identified areas were to be affected by the project, additional archaeological work would be necessary. See Appendix F for the complete report.

The UMF report divides the corridor into three sections. The first is the Black River segment, and in this segment 15 archaeologically sensitive areas (ASA) where identified. All but two ASAs within this segment are sensitive for Native American cultural resources and can generally be characterized as small, discrete portions of glacial features overlook the Black River floodplain. These areas provide potential travel routes.

Two ASAs are sensitive to potential historic Euroamerican cultural resources; one is a stone cellar hole located outside of the 100-foot corridor, and the second is sensitive because of a discontinued historic road is located nearby along with a stone foundation remnant.

The second section, the Stony Brook segment, contains 5 archaeologically sensitive areas. The ASAs within this segment are sensitive for Native American cultural resources.

The last section, the Alderbrook Road segment, has 2 archaeologically sensitive areas that are considered sensitive for Native American cultural resources.

Douglas Frink of Archaeology Consulting Team also performed Archaeological Resource Assessments (ARA) for the entire project. For the proposed St. Albans-area improvements, he concluded that although predictive modeling ranks the location moderately high for archaeological sensitivity, the ground slope is too steep to have supported Native American residential or resource-processing camps. No further archaeological investigation was recommended by Mr. Frink (see Appendix F). The stipulation from the Department of Historic Preservation (mentioned in Section 3.7 above) also covers this area, and VELCO will comply.

The ARA for the VELCO and Citizens' Highgate Substation area identified the site as highly sensitive for historic properties. Mr. Frink conducted a Phase IB Archaeological Site Identification Study, which yielded no significant Native American or European American archaeological information. VELCO filed Mr. Frink's reports on the Highgate Substation area

with the Department of Historic Preservation and will comply with its stipulation as discussed above (refer to Appendix B).

4.1.8. Health and Safety

4.1.8 (a) Substation Environment

4.1.8 (a) i. Electric and Magnetic Effects

All matter contains electrically-charged particles. Most objects are electrically neutral because positive and negative charges are present in equal numbers. When the balance of electric charges is altered, electrical effects, such as static-electricity attraction between a comb and hair, or sparks when walking on a synthetic carpet in the wintertime, are experienced. Electrical effects both in nature and in society's use of electricity (generation, transmission and consumption) produce electromagnetic fields (EMF) (www.niehs.nih.gov/emfrapid; Valberg, 2002).

The work put into electrically charging something is measured by the voltage. Voltage is the "pressure" of the electricity and is analogous to the pressure of water in a plumbing system. Electric charges push and pull on each other. Opposite charges attract, and like charges repel. Each electric charge generates an electric field that exerts force on other nearby charges. An electric field is a measure of force per unit charge but is usually expressed in units of volts per meter (V/m) (www.niehs.nih.gov/emfrapid; Valberg, 2002).

When electric charges move, an electric current exists, and a current generates a magnetic field. Units of electric current are amperes (A), and current measures the "flow" of electricity,

somewhat like the flow of water in a plumbing system. The current of moving electric charges produces a magnetic field that exerts force on other moving charges. As such, a magnetic field expresses the force per-unit length of current-carrying wire (newtons per amp-meter) but is usually expressed in units of gauss (G) or milligauss (mG). Electric motors use magnetic-field forces to turn electricity into mechanical work. Conversely, generators rotate loops of wire through magnetic fields and generate electric power from mechanical energy (www.niehs.nih.gov/emfrapid; Valberg, 2002).

Everyone is exposed to a wide variety of natural and man-made electric and magnetic fields each day. EMF fields can be slowly varying or steady (DC fields) or can vary in time (AC fields). When the time variation of interest corresponds to that of power-line currents, i.e., 60 cycles per second, the fields may be called 60 Hertz (Hz) EMF (www.niehs.nih.gov/emfrapid; Valberg, 2002).

Man-made magnetic fields are common in everyday life. Many childhood toys contain magnets. "Permanent magnets" can generate strong, steady magnetic fields. Typical household magnets (e.g., refrigerator-door magnets) produce 0.1 to 0.5 G. Magnetic resonance imaging (MRI) is a medical diagnostic procedure that puts humans in much larger fields (20 G) and is preferred over X-ray because of its safety. These are primarily DC magnetic fields (www.niehs.nih.gov/emfrapid; Valberg, 2002).

The earth's atmosphere produces slowly varying electric fields (about 100 to 10,000 V/m) that regularly discharge as lightening strikes. Magnetic fields are produced by the earth's core and

can be easily demonstrated with a compass needle. The size of the earth's magnetic field in North America is about 570 mG. Knowing the strength of the earth's field provides a perspective on the size of power-line electric and magnetic-field measurements. The earth's steady electric and magnetic fields do not have the 60-cycles-per-second (60 Hz) time-variation characteristic of power-line EMF but are otherwise indistinguishable. For example, a magnet spinning at 60 Hz can produce a magnetic field just like the magnetic field produced by 60 Hz power-line currents (www.niehs.nih.gov/emfrapid; Valberg, 2002).

Higher magnetic field levels are found near operating appliances. For example, can openers, mixers, blenders, refrigerators, fluorescent lamps, electric ranges, clothes washers, toasters, portable heaters, vacuum cleaners, electric tools, and many other appliances produce magnetic fields of size 40 – 300 mG at distances of 1 foot. Magnetic fields from personal-care appliances held within one-half foot (such as shavers, hair dryers, massagers) can produce 600 – 700 mG. In the school and work environment, copy machines, vending machines, video-display terminals, electric tools, lights and motors are all sources of EMF (www.niehs.nih.gov/emfrapid; Valberg, 2002); see also a recent study available at http://www.dhs.ca.gov/ehib/emf/RiskEvaluation/riskeval.html; a recent study from the U.K. National Radiological Protection Board at http://www.nrpb.org/press/press_releases/2004/press_release_5_04.htm , and http://www.nrpb.org/ publications/documents_of_nrpb / abstracts/absd15-2.htm; and a recent paper issued by the Pacific Northwest National Lab by Steven Goheen, summarized at http://www.pnl.gov/news/2004/04-02.htm).

Electric-transmission lines, distribution lines, and electric wiring in buildings carry alternating currents (AC) and voltages that produce 60 Hz EMF. The size of the magnetic field is

proportional to the current, and the size of the electric field is proportional to the voltage; both fields decrease rapidly with distance from the source of the electric field. When EMFs are produced by different sources (e.g., adjacent wires), the net EMF may be the sum total of both or the net EMF may be less (EMFs may add or partially cancel). Inside residences, typical baseline, 60-Hz magnetic fields (away from appliances) range from 0.5 to 2.0 mG. These fields arise from electric appliances, outdoor distribution wiring, indoor wiring and ground-return pathways. The time-varying, power-line magnetic fields add or subtract to the steady field of the earth (570 mG) (www.niehs.nih.gov/emfrapid; Valberg, 2002).

For the substations in this project, VELCO does not believe that the EMF levels will be changed significantly. VELCO proposes no changes to the substations that will create more EMF directly. The only change in the level of EMF will be the flows on the transmission lines in and out of the substations, addressed in Section 4.1.8. See EMF measurements in Appendix F. Modeling results of peak loadings ("worst case") show a predicted EMF level at the edge of the 100-foot ROW (50 feet on both sides of centerline) of approximately 16 mG which is below any existing U.S. standard. This level of EMF is about the same as the level found 1 foot from an electric shaver. (See the table of "Bathroom Sources" and more discussion on EMF levels that appear below in section 4.1.8 (b), "Transmission Line Environment."

4.1.8 (a) ii. Audible Noise

Audible noise will emanate from transformers, reactors and the cooling fans used on equipment. St. Johnsbury Substation will have no such new equipment added; therefore, there should be no increase in audible noise. The same applies at Irasburg and St. Albans Substations.

VELCO had considered installing synchronous condensers as additional equipment at Highgate that would have had to meet noise specifications; Synchronous condensers do have a noise component, which is vendor- and design-specific such that VELCO could not state at this time what the exact nature of the noise might have been. For example, one vendor's information states that its synchronous condensers, at 1 meter (39.37 inches) distance and depending on the enclosure type, could have a noise component ranging from 80 to 90 decibels (dBA).

Under the proposed general arrangement of the substation, the synchronous condensers were to be located in the northwest corner of the proposed substation. However, VELCO has decided not to install the synchronous condensers at this time.

4.1.8 (a) iii. Radio and Television Interference

In the process of the substation upgrades, VELCO will make sure that the improvements will be designed so that radio or television interference will not exceed 100 microvolts/meter at a distance of 1500 feet from any energized component in the substation. This limit applies to all frequencies between 0.4 megahertz (MHz) and 400 MHz. This frequency range also covers television interference for which the terminal will be designed to ensure that there are no "gap-type" discharges from switches, buswork, or insulator hardware.

The substation improvements will also be designed to ensure that any interference with power-line carrier and open-wire, carrier-communication systems, which generally have a frequency spectrum of 5 kilohertz (kHz) to 500 kHz, is reduced to permissible levels. As noted in Section

4.3.9 below, VELCO will ensure that any interference with radio or television reception is eliminated.

4.1.8 (b) Transmission Line Environment

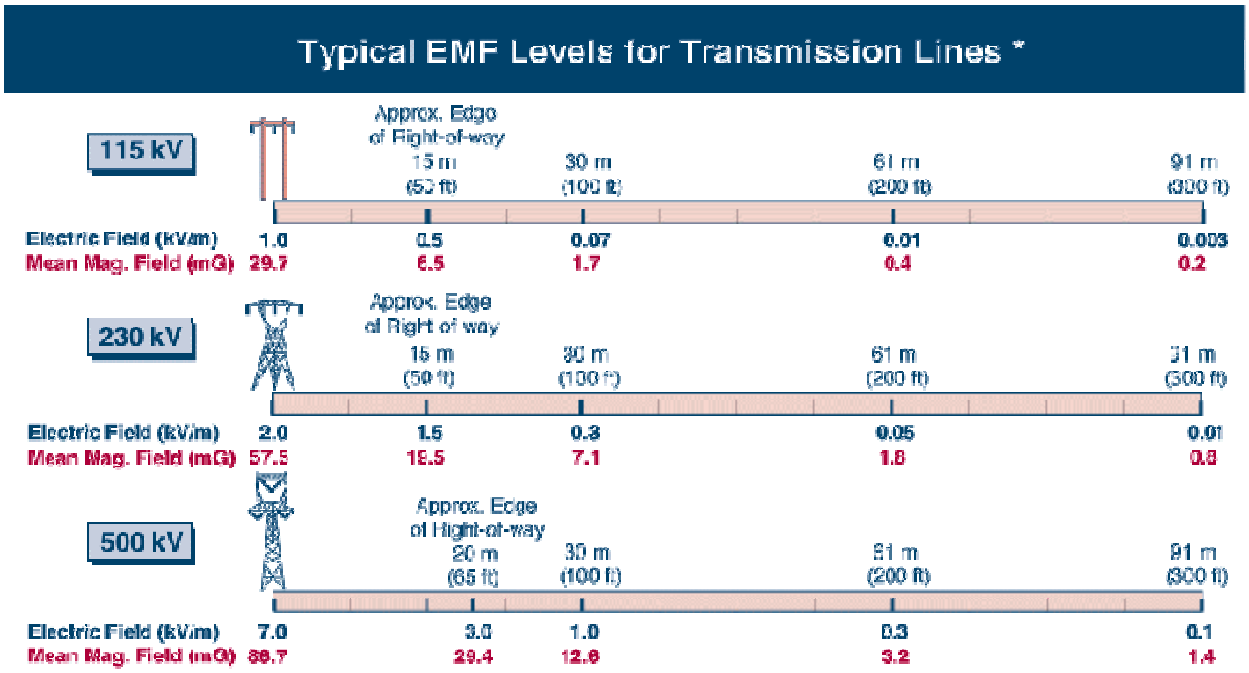
The proposed line from Irasburg to Mosher's Tap will be a double-circuit, 115-kV/48-kV transmission line. The maximum current per phase in the line will be 217 Amps with peak loads of 43 MW. The proposed line will be constructed as shown in Figure 1-6. The proposed right-of-way is 100 feet and will be cleared. Edge-of-ROW values used herein are based on that 100-foot cleared area. Corona-generated audible noise and radio and television interference are not expected from the proposed line.

Corona effects from transmission lines include audible noise, radio interference, television interference, visible light, and production of photochemical oxidants, especially ozone. These effects are produced by ionization of the air (corona) near the surface of the high-voltage, transmission-line conductors and are primarily associated with transmission lines that have voltages of 230 kV or higher. VELCO maintains its lines regularly and acts promptly in response to landowner or other inquiries to make repairs, to ensure that corona effects from leakage do not increase above the levels produced at given voltages. This project involves voltages of 115 kV and lower so there will be no corona effects.

On the Irasburg-to-Mosher's Tap line, the EMF generated by the new double-circuit line, with no distribution on the pole, is expected to have a maximum of 55.9 mG and 1.875 kV/m at center

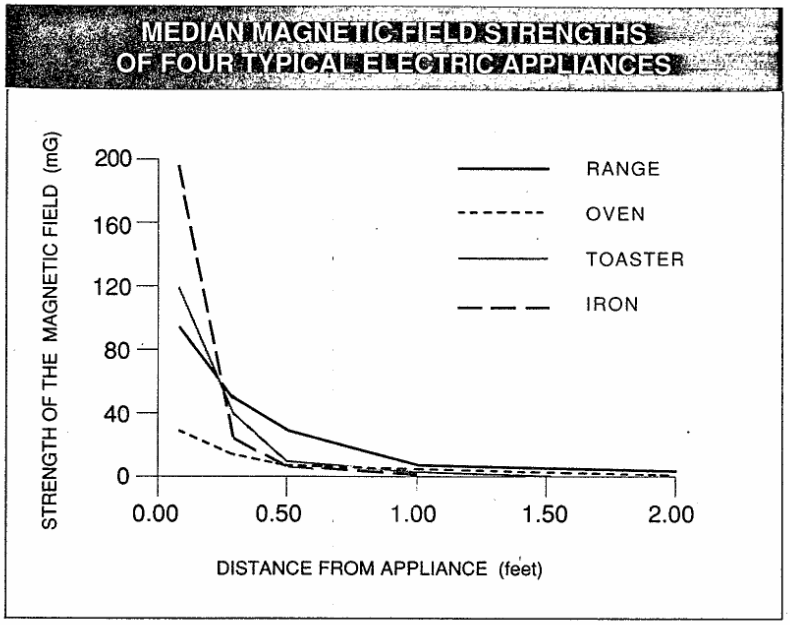
line and a maximum of 16.4 mG and 86 V/m at the edge of the ROW (50 feet from ROW center). Where the distribution is attached, the transmission lines are higher, and thus the maximum forecasted EMF will be lower. Under present conditions, with only one 48-kV circuit, the maximum EMF at centerline is around 27mG and 280 V/m. At ROW edge, the EMF is approximately 4.5 mG and 66 V/m.

As discussed above, adding the new circuit increases the EMF at the edge of right-of-way. The addition is not a significant increase (at maximum power flows, an increase of approximately 12 mG), however; is well below the standard set in two states, Florida and New York, that have established edge-of-ROW standards (150 mG and 200 mG, respectfully) (www.niehs.nih.gov/emfrapid); and is comparable or less than the fields emanating from typical power lines and common household appliances, as illustrated by the following figure and chart:



Electric fields from power lines are relatively stable because line voltage doesn't change very much. Magnetic fields on most lines fluctuate greatly as current changes in response to changing loads. Magnetic fields must be described statistically in terms of averages, maximums, etc. The magnetic fields above are means calculated for 321 power lines for 1990 annual mean loads. During peak loads (about 1% of the time), magnetic fields are about twice as strong as the mean levels above.

Source: Information Ventures, Inc., on the web at http://infoventures.com/private/federal/q&a/qaenvn2a.html



Source: EMF in Your Environment: Magnetic Field Measurements of Everyday Electrical Devices, Publication 402-R-92-008, U.S. EPA, Dec. 1992

BATHROOM SOURCES

Distance from Source	6"	1'	2'	4'
HAIR DRYERS				
Lowest	1	-	-	-
Median	300	1	-	-
Highest	700	70	10	1
ELECTRIC SHAVERS				
Lowest	4	-	-	-
Median	100	20	-	-
Highest	600	100	10	1

Magnetic field measurements in units of milligauss (mG)

Source: EPA, as above.

KITCHEN SOURCES				
Distance from Source	**6"**	**1'**	**2'**	**4'**
BLENDERS				
Lowest	30	5	-	-
Median	70	10	2	-
Highest	100	20	3	-
CAN OPENERS				
Lowest	500	40	3	-
Median	600	150	20	2
Highest	1500	300	30	4
COFFEE MAKERS				
Lowest	4	-	-	-
Median	7	-	-	-
Highest	10	1	-	-
CROCK POTS				
Lowest	3	-	-	-
Median	6	1	-	-
Highest	9	1	-	-
DISHWASHERS				
Lowest	10	6	2	-
Median	20	10	4	-
Highest	100	30	7	1
FOOD PROCESSORS				
Lowest	20	5	-	-
Median	30	6	2	-
Highest	130	20	3	-

Magnetic field measurements in units of milligauss (mG)

More “kitchen source” data follow.

The source for the two “kitchen source” tables is the EPA publication cited above.

KITCHEN SOURCES				
Distance from Source	**6"**	**1'**	**2'**	**4'**
GARBAGE DISPOSALS				
Lowest	60	8	1	-
Median	80	10	2	-
Highest	100	20	3	-
MICROWAVE OVENS				
Lowest	100	1	1	-
Median	200	40	10	2
Highest	300	200	30	20
MIXERS				
Lowest	30	5	-	-
Median	100	10	1	-
Highest	600	100	10	-
ELECTRIC OVENS				
Lowest	4	1	-	-
Median	9	4	-	-
Highest	20	5	1	-
ELECTRIC RANGES				
Lowest	20	-	-	-
Median	30	8	2	-
Highest	200	30	9	6
REFRIGERATORS				
Lowest	-	-	-	-
Median	2	2	1	-
Highest	40	20	10	10
TOASTERS				
Lowest	5	-	-	-
Median	10	3	-	-
Highest	20	7	-	-

Magnetic field measurements in units of milligauss (mG)

4.1.8 (c) Herbicide Use in Right-of-way Management

Overview. VELCO will follow its Four Year Right-of-Way Vegetation Plan (see Appendix D) in maintaining the newly-acquired rights-of-way, which describes VELCO's ROW policy, i.e., to manage vegetation growing on its transmission-line ROW in accordance with federal and Vermont laws (VELCO is also required to have a permit for use of herbicides, see Appendix D)

and regulations and with the guidance of the Independent System Operator (ISO)'s vegetation-management standards. There are two general methods of vegetation control that VELCO uses: mechanical and chemical. The mechanical methods are generally used in areas where herbicides are either restricted by regulations or prohibited by a landowner.

Chemical Management. VELCO states that it has assessed all of the significant benefits and risks of the use of chemicals (herbicides) and their alternatives in the maintenance of ROW. It has concluded that the risks of using the specific herbicides that it employs, in the manner in which it uses them, are small and that the benefits are substantial. It has therefore concluded that it will continue to use herbicides in a limited and selective manner.

Specifically, no herbicides will be used for ROW maintenance unless the herbicide is (1) registered for general use by the U.S. Environmental Protection Agency (under authority of the Federal Insecticide, Fungicide, and Rodenticide ACT (FIFRA), EPA must classify all pesticides projects for either "general" or "restricted" use), (2) approved for use by the Vermont Agency of Agriculture, and (3) determined by the Company's experience, or the experience of others, to be effective for purposes for which it is used.

General-use pesticides, as defined by the EPA, are those that will not cause unreasonable adverse effects to the user or the environment when used in accordance with the label instructions. Restricted-use pesticides are those that may cause adverse effects to the applicator or the environment unless applied by persons who have been specifically trained in their use. VELCO does not use any restricted herbicides. VELCO uses three general-use herbicides: Roundup®,

Orthotriox®, and Weed-B-Gone®. Application methods used are all manual methods that target individual plants or compact clusters of plants.

In general, herbicides used in ROW management have not been identified as sources of excess adverse health risks or as sources of excess cancer in the general public (National Academy of Sciences 1975; U.S. Department of Energy 1982). Members of the general public may potentially be exposed to herbicides used in ROW management by (a) inhalation of mists or vapors while the herbicides are dissipating into the atmosphere shortly after application; (b) absorption of freshly-applied herbicides through the skin upon contact with treated plants, grasses and soils; (c) ingestion of contaminated fruits, berries, herbs or leafy vegetables grown in the ROW; (d) ingestion of meat from wild and domestic animals and fish eating the herbicides; and (e) ingestion of contaminated water.

Because of the low volatility of the herbicides and the use of selective, ground-level application techniques, the general public is not expected to be exposed to biologically-harmful levels of herbicides by inhalation. Similarly, direct skin contact with freshly treated foliage is expected to be an insignificant source of exposure due to low application rates. The ingestion pathway produces the greatest potential for adverse health effects. Land used for raising foodstuffs will accordingly not be treated by VELCO with herbicides.

Also, VELCO employs a new spraying technique ("ultra-low volume") when applying herbicides. This new technique cuts the actual amount of chemical being applied in tenths over the amount applied in the previously-used water/chemical mix. VELCO does not spray any

ROWs that are actively farmed or grazed. In the ROWs that are treated, the half-life of the products used (all approved by the Vermont Department of Agriculture) is very short (sprayed one day, gone within the week).

Mechanical Method. The mechanical method of ROW maintenance is an alternative to the use of herbicides. These methods are much more labor-intensive and expose workers to increased risks of injuries from accidents in tool, equipment and brush handling. Although more risky for workers, these methods present little or no risk to the public. Vegetation management using herbicides, on the other hand, substantially reduces health and safety risks for the workers while slightly increasing the risks of toxic effects to the public, especially from erosion and spill-related events.

In conclusion, although the herbicides proposed for use in the ROW have low degrees of toxicity to animals and humans, their application according to label directions and VELCO's four-year, vegetation-management plan will comply with state and federal regulations and allow for their safe use. See Appendix D.

4.2 Potential Environmental Impacts Of Alternatives To Proposed Project

4.2.1 Alternate Designs and Corridors

4.2.1 (a) Alternate Design

As discussed in detail in Sections 2.4.1 and 2.4.2, ***modifying the line-design criteria*** would entail various impacts on the project and on the environment. Reducing the 115-kV circuit's

conductor size from 1272 ACSR to 556 ACSR would reduce the current-carrying capacity of the line by over 25%, which VELCO rejected in favor of using higher-capacity conductor so that increased loads may be carried in the future, thereby avoiding the additional impacts to the environment that would result in the future from having to reconductor the line.

Reducing the pole spacing would place more structures closer together along the corridor, which VELCO learned would be unacceptable to the adjacent property owners. Furthermore, reduced spans across wetlands and watercourses would have a negative impact on the environment that might not be acceptable. Finally, the increased number of structures would also increase the overall cost of the line as compared to the steel-pole line originally proposed.

Reconfiguring the double-circuit framing by any of the methods considered previously would have negative impacts on the project and the environment. It would increase the visual presence of the line by doubling the number of poles at each tangent location required and would also require additional ROW and vegetation clearing if used in succession. Additionally, within any wetlands guyed, wood-pole structures would increase the disturbance to these protected areas. Finally the "over/under" circuit configuration would impose undesirable maintenance restrictions and reduce the lines' reliability.

Undergrounding the circuits is 8 to 10 times as expensive. As noted in Section 2.4 above, undergrounding impacts the environment in many ways that overhead transmission does not. Therefore, due to both the cost and the environmental impact, VELCO does not propose to place any transmission or substation facility underground.

4.2.1 (b) i. Alternate Corridors.

Mosher's Tap – Irasburg corridor (*New Corridor Alternative*): This potential corridor is similar to the preferred corridor proposed by VELCO but follows higher ground and does not follow the valley floor in any segment. As such, it is on more steeply-sloping terrain throughout and at somewhat higher average elevation than the preferred corridor. The highest elevation is more than 925 feet.

Bedrock along this corridor is the Northfield formation of middle and upper Silurian age. This formation consists of dark gray to black quartzite-sericite slate or phyllite with fairly widely-spaced interbeds, a few inches thick of siltstone and silty crystalline limestone like that of the Waitsfield formation (Doll, 1961). The bedrock is overlain with glacial till and alluvium, especially near Stony Brook at State Route 14 where bedrock has been extensively quarried for sand and gravel.

Soils in this corridor are similar in nature to the preferred corridor but differ mostly due to steeper slopes and are consequently rockier and stonier. There are similar areas of borrow (gravel and sand extraction). Soils on elevated terrain include some areas of Cabot silt loam (a hydric soil not found on the preferred corridor). Some of the soils along this corridor are also considered primary agricultural soils (Table 2). Approximately 28.5% of the corridor occupies lands with soils that are considered to have good agricultural potential, and about 63% of these lands, or about 18% of the corridor, is actually used for agriculture at present (Countryman Environmental, unpublished data), which compares to approximately 17.5% in the preferred corridor.

Table 2. Soils in the Mosher's Tap corridor. Data from NRCS (1997).

Primary agricultural soils	
Colonel fine sandy loam	3–8% slope
Colonel fine sandy loam	8-15%
Colton-Duxbury complex	0-3%
Colton-Duxbury complex	3-8%
Irasburg loamy fine sand	3-8%
Nicholville silt loam	8-15%
Vershire-Glover complex, rocky	8-15%
Adams loamy fine sand	3-8%
Cabot silt loam	3-8%
Roundabout silt loam	0-5%
Other soils	
Colton-Duxbury complex	15-25% slope
Colton-Duxbury complex	25-60%
Buckland very fine sandy loam, very stony	8-15%
Buckland very fine sandy loam, very stony	35-60%
Adams loamy fine sand	8-15%
Adams loamy fine sand	15-25%
Adams loamy fine sand	25-60%
Glover-Vershire complex, very rocky	8-15%
Glover-Vershire complex, very rocky	15-35%
Glover-Vershire complex, very rocky	35-60%
Cabot silt loam, very stony	0-8%
Cabot silt loam, very stony	8-15%
Salmon very fine sandy loam	25-50%
Vershire-Glover complex, rocky	15-25%
Vershire-Glover complex, very stony	8-15%
Vershire-Glover complex, very stony	15-35%
Tunbridge-Lyman complex, very stony	35-60%
Wonsqueak muck	0-2%
Pits, gravel and pits, sand	

A portion of this alternate route crosses over areas that are currently farmed. Agriculture in this area is predominantly dairy, and the fields are cropped in hay or field corn or used as pasture. Most of the areas in current use are on the valley floor and on ridge tops, not on valley sides. This alternate route crosses approximately 1.25 miles of active field, predominantly in corn and hay.

The corridor also passes across approximately 0.2 miles of sugar bush (i.e., areas of forest used for maple-sugar production) and across additional lands with northern-deciduous-hardwood forest that may be suitable for maple-sugar production.

A significant gravel-extraction operation exists on the Pike Industries/ Carroll Concrete properties on State Route 14 where this alternate would cross the road. There are extensive gravel pits, a road system, loading facilities, and settling ponds.

There also are eleven residences located within 500 feet of the New Corridor Alternative corridor, most of them in rural and rural residential areas. More distant residential areas are the village of Coventry and the City of Newport.

The major commercial use on this corridor is the Pike Industries/Carroll Concrete facility located on Route 14. There is also a junkyard located on Hancock Hill Road and a “bed and breakfast” with a restaurant on Heermanville Road in Coventry. Other land uses are dedicated primarily to farming and forestry.

A commercial facility serving several businesses and self-storage units is located in and adjacent to the 120-kV corridor on Route 105 just west of the Mosher's Tap location. There is a small, locally-maintained wayside area without facilities on Route 105, just north of the potential tap location.

A water tower for the City of Newport municipal water system is located approximately 500 feet to the north of the location of the tap structure into the existing 120-kV line.

Surface waters along this route are the same as for the preferred corridor: Ware Brook, an unnamed tributary to the Black River, tributaries to Stony Brook and Alder Brook, and Stony Brook itself. Alder Brook is not within the project area, being approximately 1500 to the east. The New Corridor Alternative would cross at least 9 additional seasonal or small permanent streams that are tributaries to the above-named streams.

The New Corridor Alternative corridor would be closer to Walker Pond and the other ponds noted above than the preferred corridor. Settling ponds at the gravel pits may also be within this corridor, but no other surface waters are known. This corridor also more or less parallels the course of the Black River, which flows north into Lake Memphremagog, but it is further from the river than the preferred corridor.

This alternative is mostly further upslope than the preferred corridor, so less of the corridor is within floodplain. Because it would also cross Ware Brook, that segment would, however, cross the 100-year floodplain; this is the only floodplain area identified on this corridor.

Wetlands along this corridor were not delineated but were assessed using topographic maps, National Wetland Inventory Maps (USFWS, 1979 *et seq.*), and recent orthophotography, with limited field verification by personnel of Countryman Environmental; see the appended orthophotos with these estimated wetlands locations. Overall, the New Corridor Alternative corridor crosses a lesser amount of wetland as compared to the proposed route because it is on more elevated and more sloping terrain. The wetlands are generally similar in nature to those of the preferred corridor, but because this alternative is generally located in areas of steeper topographic relief, the "alder swamp" type of wetland is not as common. That community is, however, present along Ware Brook where it is crossed perpendicular to its length.

There are also forested wetlands and "wet meadow" communities on abandoned farmland, similar to the preferred corridor. The functions and values of these wetlands, in the aggregate, are similar to those of the preferred corridor, with the exception of protection of stream habitats, since they are mostly not associated with surface waters in the manner that some extensive wetlands of the preferred corridor are associated with Stony Brook. Refer to Table 2.2 below; also see VELCO Appendix F.

Upland terrestrial communities are similar to those noted for the preferred corridor; however, the percentage of forest lands is greater. As noted, this corridor would be an entirely-new intrusion

into forests rather than the widening of an existing corridor. Following clearing, the types of upland communities that would develop would be similar in nature to those of the existing corridor, i.e., a mix of saplings, low shrubs, brambles, ferns, grasses and forbs common to the region.

With regard to critical wildlife habitat, the New Corridor Alternative, being further upslope than the existing corridor, passes through a deer-wintering area on the southeastern slope of Cleveland Hill, rather than following along its edge as does the proposed corridor; the linear distance affected is approximately 500 feet or about 5,000 square feet. No other critical habitat is known along this corridor.

This alternate crosses about four times as much agricultural land as the preferred corridor and specifically more land currently cropped with corn. In these areas, there is little potential for utilizing fencerows and edges of fields to minimize impacts, and farmers would need to work around the utility poles.

This corridor would also affect approximately 0.2 square miles (2.4 acres) of sugar bush (i.e., areas of forest used for maple-sugar production), as noted, and would cause the loss of an estimated 200-240 trees for production. There is an estimated total of approximately 0.4 miles (4.8 acres) of potential sugarbush along this corridor.

Table 2.2 List of Wetlands, Alternate Route.

Sources: USGS topographic maps, NWI wetlands maps, and recent orthophotography with limed field verification by personnel of Countryman Environmental.

Note: Wetlands have not been delineated and all information in this table is subject to field verification and correction.

Identifier & Sheet #	Approximate Mile	Approximate linear distance of crossing (feet)	Class (Cowardin et al, 1979)	Notes
1, Sheet 1	0.5	175	PSS/PFO	Ware Brook crossing
2, Sheet 1	0.6	125	PSS/PFO	
3, Sheet 2	0.8	250	PEM/PSS	Seasonal stream, tributary to Ware Brook
4, Sheet 2	2.0	100	PEM/PSS	
5, Sheet 2	1.2	100	PEM/PFO	Seasonal stream, tributary to Ware Brook
6, Sheet 3	1.8	100	PFO/PSS	Unnamed tributary to Black River
7, Sheet 6	4.1	250	PEM	
8, Sheets 6 & 7	4.5+	1600	PEM/PSS/ & PFO	
9, Sheet 7	5.0	100	PFO	
10, Sheet 7	5.2	150	PFO/PSS	
11, Sheet 9	6.6	100	PEM	Pasture
12, Sheets & 10	6.75	600	PEM	Pasture
13, Sheet 10	7.0	150	PEM/PSS	Swale
14, Sheet 10	7.1	100	PEM/PSS	Tap structure

This alternate would require a new corridor through approximately 2.75 miles of forest cover. The longest segments would pass through forests for distances of between 0.25 and 0.5 miles. Such areas would likely be large enough to manage for forestry. Other segments would pass through smaller patches of woodland that may not be large enough for management but that may provide firewood.

As noted, a significant, ongoing gravel-extraction operation occurs on the Pike Industries/ Carroll Concrete properties on Route 14 where this alternate would cross the road. As with the preferred corridor, poles might need to be located or potentially relocated over time so as not to interfere with operations or to be sure that the pit could be operated in a safe manner. However, the presence of a powerline *per se* would not prevent extraction of earth resources in the manner that, for example, a housing development would.

The creation of a new corridor may create an opportunity for a new snowmobile trail or for rerouting of existing trails in the region. It may also provide foot access to some previously remote areas for hunting of upland game. Overall, however, this corridor would not likely have a measurable effect on recreation in the region.

No direct impacts on residences would result from this corridor. Since there are no existing transmission lines near the 11 residences located within 500 feet of this corridor, however, issues of aesthetics and electromagnetic effects may be greater than for the existing corridor, where residents have experience with the presence of a powerline.

4.2.1 (b) ii. Mosher's Tap-Irasburg Corridor (*Partially New Corridor Alternative*).

This alternate corridor is slightly longer than New Corridor Alternative or the preferred corridor and has the same impacts as the preferred corridor from Irasburg Substation to mile 4.9 and essentially the same impacts as the New Corridor Alternative from mile 4.9 to mile 7. Please refer to Section 4.2.1 (b) i, above, for discussion of the impacts of the last 2.1 miles of the New Corridor Alternative, as the impacts for the Partially New Corridor Alternative would be almost identical to those for the New Corridor Alternative in that segment. The Partially New Corridor Alternative uses the preferred (and existing) route until the corridor reaches the area of Alderbrook Road. At that location, the Partially New Corridor Alternative moves away from the existing corridor along Alderbrook Road, traversing to the other side of the valley. There it runs parallel to Alderbrook Road until meeting up with the existing corridor north of Mosher's Tap.

4.2.2 Comparison of Corridor Options

The merits of using the existing corridor, where the present line has been located for years, are thought by VELCO to be a sufficient basis to reject the two alternate corridors as noted in Section 2.2 and discussed below, including a summary comparison table.

Any new power line right-of-way creates exposures and problems that can not be anticipated. Time has a way of blending physical features, and as such VELCO believes that the addition of another circuit in the present corridor will not present a significantly different profile from the present situation.

More careful attention to pole locations in the existing corridor should help soften any visual impacts. Additionally, the line should not affect the abutting landowners, all of whom purchased their property at a time when the 48-kV line was already in service. Considering all these factors, along with the extra cost of building in an entirely-new corridor, VELCO believes it is preferable to stay within the existing corridor.

While the alternate corridors, especially the New Corridor Alternative, would have less impact on wetlands and floodplains, the corridors would have a greater impact on forest resources and actively-farmed lands, cross a deer-wintering area (as compared to the preferred corridor's passing of the area on its edge), be visible to more homes and be located on steeper, stonier soils where the risk of erosion would be of greater concern. Overall, the potential environmental impacts of using the existing, preferred corridor appear to be significantly less than the potential impacts from locating the double-circuit line in the "New Corridor Alternative" or in the "Partially New Corridor Alternative" corridors.

No Action Alternative:

Implementation of the No Action Alternative would preclude most of the anticipated effects to the environment that would be associated with the Proposed Action. Minor adverse effects, however, would result from the increasingly frequent repairs and maintenance activities. Since there would be no reason to rebuild any of the existing line at this time, there would be no alteration of the location of the poles with regard to aesthetic impact and wetland impact.

Additional clearing of the existing right-of-way by VELCO would still occur at some locations along the corridor to comply with VELCO's ROW standards.

The following table 2.3 summarizes the advantages and disadvantages of the three corridors considered and of the No Action alternative:

Table 2.3

Impact	Proposed	New Corridor Alternative	Partially New Corridor Alternative	No Action
Agricultural Land	Yes	More	More	Minimal
Removal of Trees	Limited to widening of corridor at discrete locations	New corridor	New Corridor	Limited to widening of corridor at discrete locations
Aesthetic/ Visibility	One existing line would be rebuilt	Two lines - new line and existing line - would remain	Two lines - new line and existing line - would remain	Existing line would remain as is – no improvements to sensitive areas.
Wetlands	As proposed	New line less than proposed, but existing line remains so total is more	New line less than proposed, but existing line remains so total is more.	Existing line would remain as is – no improvements to sensitive areas.
Floodplains	Yes	Yes	Yes	Yes
Wildlife/Habitat Impact	Little or none	Some additional cutting in deer-wintering area	Some additional cutting in deer-wintering area	None

4.3 Mitigation Measures

4.3.1 Air Quality

Any construction that will need to take place in identified wetlands will be undertaken in winter or during the dry season, and since most of the work is either along an existing corridor or involves existing substations, there will be little dust generated. When necessary, dust-control measures will be undertaken, such as the application of solid chloride pellets, to ensure that dust is controlled.

4.3.2 Land Features and Use

No mitigation measures are proposed: No land-use changes are anticipated except for the conversion of some areas of forest along the existing corridor's edge from forest to a managed, lower-height-vegetated corridor. See Subsections 4.3.2 (a) for VELCO's Soil Erosion Control Measures and 4.3.2 (c) for VELCO's Forestry Practices below.

4.3.2 (a) Soils

Erosion-control measures will be implemented around disturbed areas to retain soil. These measures will include, where necessary, haybale fences, silt dikes, and mats. Along the newly-cleared ROW, all non-usable branches will be chipped and spread as a ground stabilizer. See Appendix D, VELCO's Soil Erosion and Control Plan. With proper implementation of erosion-control measures, no significant loss of soils will occur. The project will meet Vermont Water Quality Standards (Appendix D).

Streambank erosion is not anticipated to occur since there are no stream crossings required to access structure locations.

4.3.2 (b) Agriculture

Disruption to agriculture will be minimal and affect primarily hay fields and pasturage at about 13 pole locations. With the use of taller poles, longer spans can be implemented, and poles will be placed carefully so as to disrupt agriculture as little as possible. Winter or off-season construction will also mitigate any effects. VELCO will also work with the individual landowners in the final determination of pole locations to minimize any potential impacts.

4.3.2 (c) Forestry

The project will have an insignificant impact on forestry resources so no mitigation is proposed. Following VELCO's normal practice, wood products associated with felling trees for additional clearing will be offered to the landowner, or the landowner will be compensated for the market value of the trees.

4.3.2 (d) Recreation

No mitigation measures are proposed: There are no identifiable impacts to recreational opportunities and, specifically, none to fishing or hunting opportunities. VELCO will continue to work with the Vermont Association of Snowmobile Travelers to assure that there will be no disruption to snowmobile trails during construction.

4.3.2 (e) Natural Areas

No mitigation measures are proposed: All natural areas are remote from the project area.

4.3.3 Hydrology, Water Quality and Water Use

No impacts to hydrological regimes will result from the project, so VELCO proposes no mitigation measures.

For water quality, erosion control will be implemented during construction, and implementation of VELCO's vegetation-management plan will ensure no degradation of water quality in the project area thereafter.

As for water use, there will be no interruption of water supplies or use associated with the project, so no mitigation is proposed.

4.3.4 Ecology

4.3.4 (a) Terrestrial

VELCO believes that its vegetation-management plan is effective at maintaining suitable plant communities and wildlife habitat in northern Vermont, and VELCO accordingly proposes no additional mitigation.

In particular, communication with the Vermont Department of Fish and Wildlife has indicated that there will be no undue adverse impacts to the deer-wintering areas adjacent to the corridor. Accordingly, VELCO does not propose mitigation specific to this one area, such as a wildlife-crossing lane.

4.3.4 (b) Aquatic (including Wetlands)

With the implementation of erosion control during construction and VELCO's vegetation-management plan, VELCO believes that impacts to these resources will be insignificant, and no special additional measures are proposed.

The vegetation-management plan, Appendix D, provides for buffer zones along streams and other waters of the state where no herbicide will be applied. VELCO believes that the shrubby vegetation along Stony Brook and its minor tributaries will continue to provide shade to the waters, so that fisheries will not be adversely affected.

Conditions of the ANR Conditional Use Determination for work in significant wetlands affected by the project include use of silt fences where necessary to prevent eroded soils from reaching wetlands. ANR also imposed a condition that these wetlands be monitored for the presence of the nuisance aquatic species, common reed (*Phragmites communis*) and purple loosestrife (*Lythrum salicaria*). If found, they are to be destroyed. The CUD says the vegetation "be pulled by hand and disposed of by burial or burning in a non-wetland location." See Appendix B.

4.3.4. (c) Threatened and Endangered Species

VELCO will avoid the State-listed plant on the project site, *Juncus greenei*. Another project that is expected to be started after the work on this project will require an endangered-species permit from ANR. Such permits typically require transplantation as a mitigative measure. ANR has already stated that the three identified plants will need to be transplanted and the remainder of the outlying population managed.

4.3.5 Socioeconomics

VELCO proposes to undertake several measures to help mitigate the effects of this project on the socioeconomics of the area. Contractors will be encouraged to employ local labor consistent with project tasks, thus decreasing local unemployment and increasing the number of non-local workers.

On the basis of meetings and consultations to date, there do not appear to be significant public concerns about the project. However, communication with town selectmen, planning commissions, regional planning commissions, individual land owners, other concerned individuals and state agencies, including the Department of Public Service, will continue so that any concerns that may exist are considered. Because the exact placement of the poles along the double-circuit line was of concern to some members of the public, special attention has been and will continue to be given to working with landowners and others most affected by pole locations. Additionally, copies of this draft Environmental Assessment are being distributed to known concerned parties for review and comment.

Once the final design stage is reached, VELCO (or its consultant) will approach each affected landowner if a reasonable change in pole placement would help mitigate any impact. These movements of poles would stay within the existing ROW, but span lengths could be altered to help mitigate environmental or visual impacts.

4.3.6 Visual Resources

4.3.6. (a) Irasburg to Mosher's Tap Corridor:

The existing transmission-line corridor, which has been in this location for many years, extends approximately 6.47 miles. With the exception of a few locations, discussed below, the existing line is located in wooded areas or is otherwise remote from view, and the line upgrade will not have a significant visual impact in these areas. The areas of most visual significance (with respect to both the existing line and the proposed new line) are limited to two: (1) where the corridor currently extends approximately 1000 feet from Back Coventry Road to Heermanville Road (at approximately miles 1.1 - 1.3, marked on Ortho Sheet 1–Appendix C); and (2) in the Alderbrook Road neighborhood, including Mosher's Tap (Ortho Sheet 3–Appendix C).

As shown on Ortho Sheet 1 of the orthophoto maps included in Appendix C, the existing 48-kV circuit departs Irasburg Substation heading northeast to an angle structure located on the hillside above State Route 14. This existing angle structure is also shown by the photograph exhibit from the nearest residence on Route 14. See Photo 1 in Appendix C. The new angle structure will be about 20-feet taller to accommodate the two circuits but will not be particularly noticeable from Route 14.

From this point, the existing corridor heads north, paralleling Route 14 for a distance of approximately 1000 feet for several spans before it disappears into a thickly wooded area. The exposure here will not be noticeable to the average motorist. From this point, the line remains out of sight for approximately one mile before it again reappears at the hillside behind the Djanikian and Bennett residences (mile 1.0 depicted by a marker shown on Ortho Sheet 1– Appendix C). Photo 2 in Appendix C is a photograph of this section of line looking south from the Djanikian residence. Since this clearing will be widened, VELCO proposes to plant–and will plant if acceptable to the landowners–pines at the lawn edge. VELCO will also clear selectively at this location to reduce the exposure of this hillside.

The line then crosses Coventry Back Road (mile 1.1; see Ortho Sheet 1 – Appendix C). Photo 3 in Appendix C is a view looking north to the McInnis property from Coventry Back Road at mile 1.1, depicting the existing landscape for the next .2 miles; photo 4 in Appendix C is a view looking north along Coventry Back Road from the Djanikian and Bennett parcel that indicates the existing and proposed crossing; photo 5 is a view looking south to the McInnis parcel from Heermanville Road (mile 1.3) at the transmission corridor on the hillside above Djanikian and Bennett properties, where planting and selective vegetation is recommended as mitigation.

At mile 1.3, the line leaves open landscape and enters second-growth vegetation and pasture west and north of Heermanville Road (see Survey Sheet 1 – Appendix C and photo 6 in Appendix C). Photo 7, Appendix C, is a view from further north on Heermanville Road at the same second-growth pasture on the Maikshilo and Dellert Parcel, showing limited visual impact occurs in this broken landscape with a wooded background.

The line then enters a wooded section at mile 1.7, crossing Linton Road (gravel) at mile 1.8. Photos 8 and 9, Appendix C, are photographs that show that the existing 48-kV line is hardly visible from Heermanville Road. As evident from the photographs, throughout this section it is difficult to see the existing structures because of the wooded hillside background. This would be true also of the new taller structures. Because of the mix of deciduous and coniferous vegetation and the hillside providing background for the line, the new line will be difficult to notice.

After the Linton hillside, the line continues to the north on the wooded hillside and does not again become visible from Route 14 until the corridor crosses the so-called "A & P Marsh Farm" (shown on Survey Sheet 2– Appendix C). The corridor in this section (mile 2.7 to mile 3.5) is located at the interface of the active agricultural land and the steep wooded hillside to the west, so that any structures seen from the parallel Route 14, which is a thousand feet distant, will be backgrounded by the mostly coniferous hillside and not be very visible.

At approximately mile 3.8, the line crosses Route 14 and stays parallel with Route 14 on the east side at a distance varying from 50 to 100 feet. The normal cone of vision of the driver through this section is represented by photographs shown in Appendix B3, Photos 10, 11, 12, and 13 in sequence; Photos 10 and 11 indicate the curvature of the road and the likelihood that the 20'-taller poles will be backgrounded; and Photos 12 and 13 show the nature of the transmission corridor pulling away from Route 14. The existing double-circuit, roadside-distribution line is more visible than the proposed transmission line through this narrow valley.

The line then continues north across Nadeau Park Road (mile 4.1 – mile 4.3) before entering a dense wooded area through Pike Industries' land and breaking into the open at mile 4.9 on the Parry Parcel, 400' to the east of Alderbrook Road (Survey Sheet 3 Appendix C). The existing and the proposed line will not be visible on this parcel or from the next parcel on Alderbrook Road because of foreground vegetation at the road frontage.

The distribution "under-build," a segment where the transmission line will have distribution line attached below the transmission conductors on the same poles (see previous Figure 2-1), begins along Alderbrook Road in Coventry at the Knight Parcel and continues to the W. & G. Lawson Parcel, providing service to both sides of Alderbrook Road for the next 1.2 miles. The line is partially visible from Alderbrook Road for the next one-half mile as it passes behind the residences of Mathieu, Durocher and Maclure (Appendix C, Photos 14 through 18) before entering a dense wooded area, which continues for the next .5 miles. Although the existing line setback from Alderbrook Road varies from 100' to 400' from Alderbrook Road, the line is not visible because of the vegetation along the Alderbrook Road in this area.

At the Mishou rental parcel, the line angles to the west and joins Alderbrook Road (mile 6.2), where it is in the open landscape along the Alderbrook Road ROW as a double circuit for 700' or two spans. At this point, the distribution line departs to a pole on the north side of Alderbrook Road, and the 48-kV (and the proposed double) circuit continues the remaining 900' to the Mosher's Tap. At the south boundary of Mosher's Tap, the line enters a conifer plantation and is not visible from Alderbrook Road. The combined circuits will tie into the 48-kV and 115-kV circuits in an open area north of the Mosher pines (see Photos 20 and 21, Appendix C).

The existing under-built Citizens 12.5-kV distribution line, as mentioned above, starts at the Knight Parcel on Alderbrook Road in Coventry and, along with the 48-kV line, is set back behind the houses (Matheiu, Durocher & Maclure, as shown on Survey Sheet 3 of Appendix C). The degree of exposure represented by the existing 48-kV line is depicted on Appendix C, Photos 14 through 18; Photo 14 is a view to the northeast from Alderbrook Road showing the existing line uphill behind P&S Mathieu, backgrounded by the tree line. The upper portion of the new structure will break the treeline from this perspective.

The 30-foot extension will cause the transmission circuits to be above the tree line and thus visible to a greater extent than the existing line. VELCO will consult affected landowners on pole placements, which present the opportunity to move the pole a short distance, an option not available if the existing line is not replaced because the project does not go forward. Moreover, the poles and under-built distribution have vegetation in the background. In some instances, the distribution poles connecting the under-build to houses are more noticeable than the 48-kV line. This will be true after the 115/48-kV line is constructed as well.

Photo 15, Appendix C, shows a similar situation to Photo 14 from a few hundred feet further north; Photo 16, from Alderbrook Road, shows the next properties north (Durocher in the foreground and Maclure in the background); Photo 17 looks southeast at the existing line uphill from Maclure; and Photo 18 looks southeast and again shows the extent of exposure through the open-landscape section beyond the foreground house on Alderbrook Road.

As mentioned, this is an area of exposure. The ROW clearing at the Mosher's pines will be widened. As discussed with the Moshers, VELCO will plant approximately 80 evergreens, between 8’ and 12’ in height, to fill the 100' ROW at the beginning and end of the clearing on Mosher’s property. The Mosher house is located up a long drive, approximately 900' from the line. The Moshers will see the clearing and some of the structures as they enter their driveway, but the above-mentioned planting will mitigate visual impacts since visibility into the clearing will be diminished by above-eye-height pines.

Several other measures will be taken to decrease the visibility of the proposed route:

One measure is to use techniques that will blend the line into the natural environment. For example, Corten™ steel poles will be used when wood or laminated wood poles cannot be used: Corten™ naturally oxidizes, so from a distance the pole looks like wood and therefore quickly blends into the natural environment. VELCO, again, will also consult with adjacent landowners about pole placement.

Screening will be used when possible to minimize exposure. In two of the more visible sections, VELCO will plant trees and shrubs for screening purposes. As discussed above, in section 2.1, the existing transmission-line corridor has been in this location since the 1920’s.

With the exception of a few locations, discussed next, the existing line is located in wooded areas or is otherwise remote from view, and the line upgrade will not have a significant visual impact

in these areas. The areas of most visual significance (with respect to both the existing line and the proposed new line) are limited to two: (1) where the corridor currently extends approximately 1000 feet from Back Coventry Road to Heermanville Road (at approximately miles 1.1 - 1.3, marked on Sheet 1 of Appendix C); and (2) in the Alderbrook Road neighborhood, including Mosher's Tap (Sheet 3 of Appendix C).

Photo 2, Appendix C, is a photograph of the first section of line, looking south from the Djanikian residence. Since this clearing will be widened, VELCO will plant pines at the lawn edge if acceptable to the landowner and clear the ROW selectively to reduce the exposure of this hillside.

The ROW clearing at Mosher's pines, the second section of corridor that requires mitigation, will be widened (Appendix C, Photos 19 and 20). White pines will be used to fill the 100' ROW at the beginning and end of the clearing on Mosher’s property. The Mosher house is located up a long drive, approximately 900' from the line. The Moshers will see the clearing and some of the structures as they enter their driveway, but the above-mentioned planting will help screen their view of the line since its visibility into the clearing will be diminished by above-eye-height pines.

Also, wherever possible VELCO has located the line at the landscape edge between forest and field within the existing corridor. This is one of the best techniques to screen a powerline since the woods act as a backdrop, thus minimizing visual impact.

Property owners in most cases, however, have the potential to screen structures from their living areas by planting vegetation, such as conifer trees. By co-locating the transmission facilities with the existing transmission line, which Citizens operated in this location for many years, VELCO has mitigated potential impacts that would otherwise be caused by the addition of a second line and a new corridor.

4.3.6 (b) Substations:

Irasburg and St. Johnsbury:

The St. Johnsbury Substation is remote and not visible from either Interstate 93 or Higgins Hill Road (where it is located). Irasburg Substation is located off State Route 14, set back several hundred feet behind a densely vegetated hill. It is not visible from the roadway. Improvements at both substations will not have any adverse aesthetic impact.

Highgate Substation:

The proposed Highgate Substation, located immediately off of State Route 78, will be a consolidation of the existing VELCO Highgate Substation and the existing Citizens Highgate Substation, allowing better screening from Route 78. Currently there is a heavy screen of brush along Route 78, including alders, poplars, ash and dogwood, with an interruption of the screen by the VELCO access drive. By using the existing Citizens drive and discontinuing use of the VELCO access drive, and therefore eliminating this interruption, better screening can be provided along Route 78. Specifically, VELCO will plant conifers at this location. When

adequately planted, there will be minimal adverse visual conditions, and the combination of the two substations into one organized entity served by a common access road along the east side of the site will mitigate adverse visual impacts.

St. Albans:

This is a particularly good location as there are no houses or roads in close proximity. The closest house is over the hill, and the new equipment will not be visible and thus this facility will have no adverse aesthetic impact. In fact, the existing switch (GOAB), shown in the photo in Appendix 11 is 85' tall and will be removed. The tallest equipment proposed is 55'.

4.3.7 Cultural Resources

VELCO retained both the University of Maine at Farmington (UMF) and Douglas Frink, principal investigator for Archaeology Consulting Team, Inc., to assess the archaeologically-sensitive areas along the existing corridor and the existing substations. Refer to both reports in Appendix F.

UMF performed an Archaeological Resource Assessment Study (ARA) for both the line corridor and Highgate Substation. Mr. Frink performed an Archaeological Resource Assessment Study (ARA) for the Irasburg, Coventry and Newport areas affected by the project as well as the St. Albans area. Due to suspected high sensitivity of the Highgate region, Mr. Frink conducted a Phase I Archaeological Site Identification Study for that area, found in Appendix F.

The archaeologically-sensitive areas are shown on the preliminary survey, provided in Appendix C. As recommended by Mr. Frink, VELCO's final design for the new transmission structures will avoid impacting the sensitive sites wherever possible. Mr. Frink's ARA was filed with the Division for Historic Preservation, and VELCO's compliance with the design is a condition to the project approval issued by the Vermont Public Service Board. The State Historic Preservation Officer (SHPO) recommended six conditions dealing with mitigation measures that would be necessary if avoidance is not possible, and these conditions were included in the Certificate of Public Good received from the Vermont Public Service Board (see Section 4.1.7 above).

If unanticipated archaeological or human remains are encountered during construction, all construction will be halted in that area and the remains protected intact until the Division of Historic Preservation decides if further mitigation is necessary.

4.3.8 Electric, Magnetic and Noise Hazards

Electric and Magnetic Hazards

As discussed in Section 4.1.8, neither the improvements in the substations nor the re-build of the transmission line will result in significant change in the electric and magnetic fields or ion generation. The potential effects, including radio interference, television interference, visible light and the production of photochemical oxidants, will be negligible.

Noise Hazards

The audible-noise level, due principally to the synchronous condensers if installed at Highgate Substation, will be under 55 dBA at the property line (which compares to the typical noise level of a suburban living room area). See, for example, the Sound Level Chart below that provides typical noise level data for familiar noise sources. Accordingly, no mitigation measures are proposed.

Sound Level Chart

Location	Minimum (dBA)	Maximum (dBA)
Inside Home	25	45
Inside Office	35	50
Inside Airplane Cabin	75	85
Inside Factory	65	100
Talking @ 3 ft	55	65
Shouting @ 3 ft	75	85
Clothes Dryer @ 3 ft	55	65
Vacuum @ 3 ft	65	80
Chain Saw @ 3 ft	100	120
Clothes Washer @ 3 ft	55	75
Car @ 25 ft @ 65 mph	70	80
Airplane @ 1000 ft	95	110
Traffic @ 300 ft	40	60
Rural Ambient	25	35

Source: http://www.rfcafe.com/references/general/sound_level.htm

Herbicide Use

To ensure the safe use of herbicides in right-of-way management, only those pesticides and herbicides that are approved by the U.S. Environmental Protection Agency and the Vermont Agency of Agriculture, upon the advice of the Vermont Pesticide Advisory Council, will be used. In addition, all federal and state requirements for application of herbicides will be followed. Herbicide applications will be made by certified personnel according to all label instructions. See Appendix D.

State regulations adopted by the Vermont Agency of Agriculture will be followed for herbicide application near open water, wetlands, water supplies or homes. Herbicides will not be applied during rain or when rain is likely. The public will be notified during times of herbicide application by publishing notice of VELCO's proposed use of herbicides in newspapers of general circulation in the area, as required by Vermont law.

4.3.9 Radio and Television Interference

The proposed project is not expected to create any significant radio or television interference, so no mitigation measures are proposed. VELCO will, however, work with nearby homes and businesses complaining of interference to determine the cause and mitigate any interference.

4.4 Adverse Environmental Effects That Cannot Be Avoided if Project is Implemented

4.4.1 Air Quality

The proposed project will not have any significant air-quality impacts, other than the possibility of fugitive dust emissions during construction, which will be controlled using the techniques described previously in Section 4.1.1.

4.4.2 Land Use

There are few adverse environmental effects along the proposed corridor, especially since that corridor exists today. Where the route runs through agricultural land, the negative land-use effects will, for the most part, be mitigated. If there are any poles that must be placed on agricultural land, approximately .002 acres immediately under and adjacent to the pole will be unavailable for farming as is the case today where the existing poles are placed in agricultural land.

In the wooded and residential areas within the 100 foot right-of-way, current and future land use will be restricted to maintenance activities for the line. Farming activities may continue as before. Furthermore, the affected area will be very small, since poles and the ROW already exist.

4.4.3 Geology and Hydrology

The erosion-control plan, provided in Appendix D, is designed to ensure that no discharges of water will occur that would violate the Vermont Water Quality Standards, and VELCO will require its contractors to apply the techniques required in, and will monitor their compliance with, this plan. Because the proposed project is within an existing corridor, any impacts on

hydrology, such as increased evapotranspiration[16] or increased runoff, are anticipated to be insignificant.

4.4.4 Forestry and Natural Areas

There will be conversion of some 100-foot-ROW areas from forest-corridor edge to a managed corridor with lower-growing vegetation. This conversion will not affect forestry in the region adversely.

4.4.5 Ecology

4.4.5 (a) Terrestrial

There will likely be some shift in plant communities but not of an adverse nature, because the areas of additional clearing will develop into communities similar to those within the existing ROW.

4.4.5 (b) Aquatic (including Wetlands)

While the potential for adverse consequences is present, the mitigation measures outlined in Section 4.3.4 will minimize unavoidable impacts. A permanent conversion of wetlands to land for the substation expansion at Highgate and for pole placements along the preferred corridor will occur, totaling 35,249 square feet (0.91 acres; about ¼ of the wetlands in and immediately

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16 Loss of water from the soil both by evaporation and by transpiration from the plants growing thereon. Ref.: Merriam-Webster on line (http://www.m-w.com).

surrounding the substation), and has been permitted by the US Army Corps of Engineers under Vermont General Permit Number 58.

4.4.5 (c) Floodplains

There will be only be minimal loss of floodplain area along Ware Brook and Stony Brook due to the placement of several poles.

4.4.5 (d) Critical Wildlife Habitat

Only a minimal loss of critical wildlife habitat will result from additional clearing along the edge of one identified deer-wintering area. Some impacts to general wildlife habitat in the region will occur, but these impacts will not affect critical habitat. See Section 4.1.4.

4.4.5 (e) Endangered Species

No impacts are anticipated. If necessary, a few plants of the State-endangered Greene's rush might be impacted, but, if this were to occur, the plants would be transplanted to adjacent habitat.

4.4.6 Health and Safety

4.4.6 (a) Electric and Magnetic Hazards

As discussed in Sections 4.1.8, and 4.3.8, electrical fields will increase at the time of maximum loading by 12 mG, which is less than what would typically be measured about 6 inches from a household dishwashing machine. Neither the improvements in the substations nor the re-build of

the transmission line will cause increases of electric and magnetic fields or ion generation that come close to posing any hazard. The potential effects, including radio interference, television interference, visible light and the production of photochemical oxidants, will be negligible.

4.4.6 (b) Herbicide Use

Herbicide use will occur, as described in Appendix D (See VELCO's Four Year Right-of-Way Vegetation Management Plan and the Vermont Department of Agriculture's Permit to Conduct ROW Herbicide Treatment). No herbicides will be used for ROW maintenance unless the herbicide is (1) registered for general use by the U.S. Environmental Protection Agency (under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), EPA must classify all pesticide products for either "general" or "restricted" use), (2) approved for use by the Vermont Agency of Agriculture, and (3) determined by the company's experience, or the experience of others, to be effective for the purpose for which it is used.

VELCO will be prohibited from using any herbicides unless it has obtained a permit from the Agency of Agriculture approving the compound, concentration of chemical and method of application. It must, moreover, publish notice of its planned use of herbicides in newspapers of general circulation in the area, and concerned landowners may contact the Agency of Agriculture before the permit issues. Thus, the use of herbicides is regulated, and VELCO will only receive authorization to use herbicides if the Agency of Agriculture issues a permit after finding that VELCO's use of herbicides meets the requirements of state law and will be safe.

4.5 Irreversible and Irretrievable Commitments of Resources

In general, the project does not use land irretrievably as the land on which the project will be built is used today for substation or transmission-line purposes. At some future date, the substations and line could be removed, and the underlying land would over time succeed to a natural state.

4.5.1 Geology and Hydrology

The small areas of soils disturbed by foundation structures and general construction activities will be permanently altered by the proposed project. Soil fertility will be decreased slightly by these activities, and very small losses due to erosion will occur where existing access roads cross or exist near surface-water systems. Sedimentation rates may be increased and may alter the surface-water system's characteristics, especially in first-order watersheds. Planned mitigation measures will reduce and limit any adverse impact. See Section 4.3.2.

4.5.2 Ecology

4.5.2 (a) Terrestrial

Although wildlife habitat would be somewhat altered due to the widening in places of the ROW, cover similar to existing habitat could be partially recovered by selective clearing and re-vegetation. In this regional setting, the widening of the existing corridor will not have an adverse effect on wildlife, which migrate throughout the area in which the corridor is located and are not

dependent on habitat found only in that part of the corridor that must be cleared and naturally revegetated.

As noted, the woodcock habitat along Alder Brook will remain essentially intact because alders can be spanned without cutting, and the minor widening of the corridor for a short distance along the edge of the deer-wintering area will not significantly impact that critical habitat, as determined by the Vermont Department of Fish and Wildlife regional biologist who reviewed the project.

Purdue University Professors Dr. William Byrnes and Dr. William Bramble conducted a wildlife-impact research project over the last 47 years. The project concentrated on the vegetation on utility ROWs and the relationship to the habitat of wildlife. The research documented the effects that many different vegetation-management techniques have on food and cover for whitetail deer, cottontail rabbit, ruffed grouse, wild turkey, songbirds and other small mammals and birds and concluded that the impacts of the changed habit are beneficial to wildlife.

Selective clearing and VELCO's vegetation-management techniques will create low-growing shrubs and other vegetation that will support wildlife and provide food for some species such as deer.

4.5.2 (b) Aquatic

Aquatic and wetland habitat commitments (e.g., for right-of-way clearing) would be relatively minor. The greatest would be the loss of approximately ½ acre of habitat, mostly for songbirds, at Highgate Substation.

4.5.3 Socioeconomics

Potential developers of residential land through which the line will (and does) pass could lose income from loss of sales and cancellation of building plans. Sale values of land and residences along the line could decrease during the construction period and for the first sales following the project's completion. Because of the lines that exist today and the use by VELCO of the same corridor, this outcome will not be significant and is an unavoidable consequence of locating a transmission line.

4.5.3 (a) Property Value Impact

The project could possibly cause minor negative impacts on property values. Existing property values already account for the presence of the 48-kV transmission line in the viewsheds of nearby residences. Studies of the potential effects of transmission lines on property values have been conducted, but very little statistical information exists on the relationship between property values and the construction of new transmission lines in existing ROW.

The Edison Electric Institute published an inventory of the major research to date on how the public perceives transmission lines (EEI March 1992). The study concluded that overhead

transmission lines have the potential to reduce the sale price of residential and agricultural property. This effect is generally small (0 to 10%) for single-family homes and diminishes over time after construction.

A study in Connecticut (Real Estate Counseling Group of Connecticut, 1984) found that 90% of all real-estate professionals surveyed thought the presence of transmission lines generally had a negative effect on sales price, but a statistical analysis showed only 4 to 6% of the property owners reported paying lower prices because of the presence of transmission lines. Also, see a similar study conducted in Toronto, summarized in Section 4.1.5.